ANCIENT HUNTERS

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ANCIENT HUNTERS

And their Modern Representatives

BY

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PREFACE

The substance of this work, at least in its main outlines, was first set forth in a course of three lectures delivered before the Royal Institution in 1906, and subsequently published as a series of articles contributed, at the request of the Editor, Dr. N. H. Alcock, to *Science Progress*.

My original intention was simply to gather these together and to republish them in book form with adequate illustration. But in the meanwhile the rapid progress of discovery had rendered necessary so many changes in the text that I took advantage of the opportunity to introduce a good deal of additional matter, and to enlarge the short summaries treating of recent hunting races, especially the Australians and Bushmen.

The manuscript as delivered to the printers in 1910 contained an account of our knowledge as it existed up to the end of the previous year; since then, however, many important discoveries have been made known; to render an account of them all was impossible, but by the kind indulgence of Messrs. Macmillan, I have been able to incorporate such as are of more than usual interest, particularly to myself. This must be my apology to those Authors whose recent work finds no mention. I especially regret that I have been unable to refer to Mr. Marett's account of his explorations in

Jersey,[1] and the important conclusions to which they lead on the oscillations of land and sea.

My thanks are due to a number of friends who have assisted me in my studies. In France, our great teacher in these matters, I am indebted first to M. Cartailhac, the Nestor of pre-historic Archæology, through whose kindness I enjoyed, in company with my friend Mr. Marett, an unrivalled opportunity of studying the painted caves of Ariège and the Hautes Pyrénées, and next to Prof. Breuil and M. Peyrony, who made us acquainted with those of Dordogne, to Prof. Boule, who introduced me to the fossil man of La Chapelle-aux-Saints, and to M. Commont, who initiated me into the mysteries of the Mousterian industry. In Germany I learnt much from Dr. R. R. Schmidt, who guided my studies of the Palæolithic deposits of Würtemburg; in Belgium from M. Rutot, whose kindness and information are both inexhaustible, as well as from Professors Fraipont and Max Lohest, the discoverers and expounders of the skeletons from Spy. In England my old friend the Rev. Magens Mello guided me through the caves of Creswell Crag; Dr. Sturge made me at home among the treasures of his great collection, probably one of the finest collections of flint implements in the world; Prof. Tylor, Prof. Haddon, Mr. H. Balfour and Mr. Montgomery Bell, have assisted me in the most efficacious manner, by frank discussion, and the late Mr. Pengelly many years ago led me with humorous and illuminating discourse through the recesses of the famous Kent's Hole, near Torquay.

I am also under great obligations to those generous friends and colleagues who have given me permission to

[1] R. R. Marett, "Pleistocene Man in Jersey," *Archæologia*, 1911, lxii., pp. 449–480.

borrow illustrations from their published works; in every case acknowledgment has been made of the source, but I desire in addition to express my especial thanks to Professor Boule and the publishers of *L'Anthropologie*, who have allowed me to ransack this thesaurus and to carry away from it some of my richest spoils; to M. Commont, whose figures of Mousterian implements are all from his own collection; to the Smithsonian Institution for the use of many illustrations published by the Bureau of American Ethnology, and to the "Commission for Ledelsen af de geologiske og geographiske Undersøgelser i Grønland," for the use of illustrations published in the *Meddelelser om Grønland*.

I have also to thank my assistant Mr. C. J. Bayzand for the skilful manner in which he has prepared the illustrations for publication; many of them have been re-drawn by him.

I believe this is the first time that a general survey has been attempted—at least in the English tongue—of the vast store of facts which have rewarded the labours of investigators into the early history of Man during the past half-century. It is difficult to overestimate their importance; they afford a new picture of the mode of life and intellectual status of our primitive predecessors, differing in many of its details from that which suggested itself to the imagination of earlier investigators.

In reviewing the successive Palæolithic industries as they occur in Europe, I find little evidence of indigenous evolution, but much that suggests the influence of migrating races; if this is a heresy it is at least respectable and is now rapidly gaining adherents. In a collateral branch of enquiry it has been powerfully

advocated by Graebner [1] and it received the support of Dr. Rivers in his recent important Address to the British Association at Portsmouth.[2]

No allusion has been made to the belief so strongly held by Piette that the Aurignacians had learnt to bridle the horse, because the evidence seemed insufficient to establish so startling a conclusion; now, however, we have reason to believe that the Magdalenians drove behind a reindeer harnessed to a sledge, Piette's view acquires a fresh interest, and deserves renewed investigation.

In every branch of Natural Science progress is now so rapid that few accepted conclusions can be regarded as more than provisional; and this is especially true of prehistoric Archæology. General views, whatever other interest they may have, are chiefly useful as suggesting the way to fresh enquiry. If the brief summary presented in the present work should have happily that effect, it will have exceeded my anticipations in accomplishing its aim.

W. J. SOLLAS.

UNIVERSITY COLLEGE, OXFORD.
September, 1911.

[1] "Die melanesische Bogenkultur und ihre Verwandten," *Anthropos*, 1909, iv., pp. 726 and 998.

[2] Presidential Address, Section H, "Anthropology," *Nature*, lxxxvii., p. 356, September 14th, 1911.

PREFACE TO THE SECOND EDITION

I REGRET that, owing to the unexpectedly rapid exhaustion of the first edition, this work should have been so long out of print. Advantage has been taken of the opportunity to bring the present edition abreast of the most recent advances in our knowledge: many changes have been made, partly by amplification, partly by amendment, but without seriously affecting the general argument.

Some views which were admittedly heretical, when originally put forward, have since ceased to be so and have acquired indeed a dangerously orthodox complexion: at the last meeting of the International Congress of Anthropologists in Geneva much might have been heard of the effects of migration, but little of indigenous evolution.

It is unfortunate that some important questions, such for instance as the "Antiquity of Man," still remain open to controversy. In such cases I have endeavoured, without suppressing my own opinions, to represent the views of each side with equal fairness.

A remark which has not always been rightly understood, on the inadequacy of natural selection as a creative agent, has aroused an astonishing degree of resentment among some of my critics, who seem to be still sleeping in the Victorian era, and so little aware of the tendency of modern thought that one of them at least

does not hesitate to associate an adverse criticism of the Darwinian hypothesis with a perverse desire to "belittle Darwin"!

Since the publication of the first edition, several important works on the same or similar subjects have made their appearance; I should like especially to call attention to Dr. Marett's "Anthropology"—that fascinating introduction to one of the most fascinating of our sciences,—and Dr. Obermaier's "Der Mensch der Vorzeit," which only requires the addition of bibliographical references to render it as useful to the expert as it is informing to the layman. Here, too, though of a more special character, may be mentioned Monsieur V. Commont's monograph on the Palæolithic remains of the Somme valley,[1] a great work crowning his arduous labours prolonged through many years.

I am greatly indebted to numerous friends for freely given help and comment. The Abbé Breuil was kind enough to go through the first edition with me, and to point out its errors and omissions. At the last moment, after the revise had passed through my hands, the happy chance of finding myself in the company of several distinguished anthropologists on board the *Orvieto* bound for the meeting of the British Association in Australia, afforded me an opportunity of submitting the chapter on the aborigines of that continent to their criticism, and I have now the pleasure of thanking Mr. E. S. Hartland, and professors von Luschan, Haddon, Marett, and Myres, for numerous emendations, which have been incorporated in the text wherever that was possible without overrunning the page. Mr. Hartland rightly objected to the term

[1] V. Commont, *Les Hommes contemporains du Renne dans la Vallée de la Somme*, Amiens, 1914, pp. 438, and 131 figs.

"gods" as used on p. 253, and I agree with him in thinking that "mythical beings" would be more correct. Professor Haddon took exception to the phrase "Australians—the Mousterians of the Antipodes" as going too far, but the qualified sense in which it is intended will, I think, be sufficiently evident from the context.

I take this opportunity to thank also my friends and correspondents who have freely put important information at my disposal, especially Dr. W. Booth Pearsall, Mr. G. B. Grinnell, Mr. Reid Moir, and Mr. Heron-Allen.

I have not thought it worth while to allude to human skeletons which have been regarded as Palæolithic on insufficient evidence; the Galley Hill remains, described [1] for the first time seven years after their discovery, may well have owed their position in ancient gravels to a comparatively recent interment, and the same explanation may be extended to the skeleton found in mid-glacial sands at or near Ipswich.

Of direct evidence in proof of the antiquity of man in Australia there has hitherto been a remarkable deficiency, so that some authors have been able to maintain that the existing aborigines must have entered the continent at a comparatively recent date. Very welcome therefore is the discovery, announced too late for discussion in the text, which was brought before the meeting of the British Association in Sydney by Professors Edgeworth David and J. T. Wilson, when they described a human skull, found along with extinct mammalia, from the Pleistocene deposits of the Darling Downs. For full particulars we must await the detailed

[1] E. T. Newton, "On a Human Skull and Limb Bones from the Palæolithic Terrace-gravels at Galley Hill, Kent," *Quart. Journ. Geol. Soc.*, 1895, li., p. 505 f.

account now in course of preparation; here it may suffice to say that, judging by the face alone, this skull must have belonged to the same race as the existing aborigines; but the teeth point to a stage much more primitive; apart from some peculiar simian characters presented by the canines there is a diastema in the dentition of the upper jaw which strongly recalls that of the Piltdown skull. This discovery, should it be confirmed, will not only carry the existence of the Australian aborigines back into the remote Pleistocene epoch, but will at the same time afford important evidence of evolution in place.

In conclusion I should like to express my gratitude to my wife and to my daughter Igerna, for their invaluable assistance in seeing this work through the press and in constructing the index.

W. J. SOLLAS.

UNIVERSITY COLLEGE, OXFORD.
January 26th, 1915.

PREFACE TO THE THIRD EDITION

The nine years which have elapsed since the appearance of the last edition of *Ancient Hunters* have been fertile in discovery, and this is true more particularly of the latter part of this period, which has witnessed nothing less than a revolution in some of our views on fundamental questions.

The unavoidable delay which has occurred in the preparation of the present edition is the less to be regretted since it has afforded an opportunity of incorporating the latest additions to our knowledge and of setting forth the subject in a new and enlarged perspective.

The growth of our science has been accompanied by a reawakened interest in it on the part of the reading world; of this gratifying evidence is afforded by the appearance in this country of two successful textbooks, one entitled *Prehistory*, by Mr. M. C. Burkitt, who has lighted his torch from the Abbé Breuil's and writes from first-hand knowledge; the other by Prof. R. A. Macalister, which appears as the first volume of a *Text-book of European Archæology*, and is truly encyclopædic in its scope. We have also to welcome an English translation by Dr. James and Jessie Ritchie of Prof. Boule's classic work on *Fossil Man*, which illuminates so clearly the palæontological side of this subject, and there is further a promise from America of a translation of Dr. Obermaier's invaluable *El Hombre Fósil*. Of more popular

works we have the opening chapter of Mr. H. G. Wells' *Short History of the World,* and the delightful little book with its charming illustrations by Marjorie and C. H. B. Quennell on *Everyday Life in the Old Stone Age.*

Apart from these in its interest as a signal recognition of the young science by the classical school is the scholarly and suggestive treatise on *Primitive Man in Geological Time*, written by Prof. John L. Myres as an introduction to the "Cambridge Ancient History."

A special note is necessary on Chapter VIII of this edition, which treats of the Eskimo. It owes a large part of its value to the annotations extracted from much fuller comments which have been generously communicated to me by Vilhjalmur Stefansson. This famous explorer has lived so long among the various tribes of Eskimo which inhabit the Arctic fringe of North America, and on such intimate terms with them, that he has become almost one of themselves. Speaking their language in all its various dialects, adapting himself to their customs and mode of life, he has gained their sympathy by manifesting his own, and has so attained not only a more extensive knowledge of this interesting people, but a deeper insight into their inner life than any investigator before or since.

To give a comprehensive summary of the Eskimo, scattered as they are over so wide an area and in communities differing so greatly in habits and customs, is an extremely difficult task; what is true of one society is not always true of another, and thus general statements are often open to exceptions. Of the present account it can only be claimed that it makes as close an approximation to the truth as is possible within so narrow a compass.

I should like in conclusion to express my thanks to

those numerous investigators who have assisted me in my studies, and especially for the pains they have taken to bring me into personal contact with the facts of their most recent discoveries.

To my kind and hospitable friends in France I am under particular obligations. For my knowledge of the Tuc d'Audoubert and Les Trois Frères I am indebted to Count Bégouen—the fortunate possessor of those magical galleries of art—and to the Abbé Breuil, who conducted me over them.

MM. Louis and Jacques Bégouen made my second visit to Les Trois Frères as enjoyable as it was instructive. M. Nobert Casteret conducted me over the Grotte de Montespan, soon after its discovery which he had accomplished by a remarkable feat of daring. Prof. Depéret and Dr. Mayet introduced me to the newly-discovered skeletons [1] of Aurignacian age from Solutré and the engraved pebbles of La Colombière. M. Marty demonstrated to me in the field the geology of the eolith-bearing area of Le Puy Boudieu in Aurillac. The Abbé Bouyssonie showed me his rich collection of Aurignacian implements, and M. de Villeneuve was my guide to the treasures of the Grottes de Grimaldi, which include as their latest find an asserted Chellean industry with a fauna which includes a fossil species of the interesting genus Cuon.

My especial thanks are due to my old friends, Prof.

[1] As my knowledge of these skeletons was acquired too late for insertion in the body of the text, I take this opportunity to add that two of them are the remains of Crô-Magnon men, and one of a woman belonging to another but undetermined race: there are also the bones of several children, one unborn. Prof. Depéret thinks that the woman was captured by the Crô-Magnons and became one of the family. After she had borne several children the family was attacked by hostile neighbours. Some were slain; these were interred in graves marked by lateral tombstones, one on each side of the head: their skeletons now rest in the Museum of the University of Lyons.

Boule and Prof. Breuil, who have never failed to respond to my demands, however exacting, upon their vast stores of learning and experience.

At home I am no less indebted to my friends in England, Prof. Marr, Mr. Reid Moir, Dr. Smith Woodward, Mr. Henry Balfour, Mr. Burkitt, Mr. Hazzledine Warren—who agrees with Prof. Boule in still maintaining that eoliths do not owe their shape to human agency—Mr. Chandler, Dr. Palmer and finally Prof. Elliot Smith, whose remarkable work on megaliths and mummies has an important bearing on several of the problems which await our discussion.

University College, Oxford,
January, 1924.

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399 Cave of Montespan. (See this page below and following pages to xxxvi.)

595 After Aleutian Isles add : Professor Hrdlička has recognised among the existing races which inhabit parts of Eastern Siberia and Mongolia the remains of an ancient population which, on the one hand, is related to Palæolithic Europeans, and, on the other, physically identical with the existing American Indians.

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106 in third line, *for* " Hamel " *read* " Hamel-Nandrin."

261 last line of foot-note, *for* " Branca " *read* " Bianco."

570 Fig. 325, *for* " after Steensby " *read* " from Steensby."

594 last line of second footnote, *for* " Wiegers " *read* " Weigers."

Early in November of last year news reached me of a fresh discovery in the South of France of a companion cave to Tuc d'Audoubert, which was exciting great interest among French archæologists. Great, therefore, was my delight when I received an invitation from Count Bégouen to visit this cave, and I responded by starting immediately for Toulouse. At Paris I was joined by my friend and former pupil, Dr. Sandford, and on our arrival at Toulouse we were taken in hand by Count Bégouen, who, with the generous assistance of his sons, MM. Jacques and Louis Bégouen, had made every

arrangement for our entertainment and transport by automobile from place to place.

On my return home I at once drew up an account of what I had learnt for insertion in the text of this edition, but by some oversight, not discovered till the index was in proof, this was not sent to the printers, and was afterwards destroyed under the mistaken impression that it was already in type and passed for press.

This is my apology for the following abstract—unduly brief—or addendum—unusually long.

The Cavern of Montespan.

We arrive at our destination; the Pyrenees, already sprinkled with snow, stretch in a long line to the South of us; in front we look upon a richly wooded hill, on its summit stands the ruined château of Madame de Montespan, at its foot is the entrance to the cavern. We descend through a narrow shaft or "chimney" and find ourselves in a lofty tunnel, throughout which flows the stream which has hollowed out the cave. Proceeding along this, we are soon brought to an abrupt stop by a sheet of water which fills the tunnel from side to side, and the roof of the tunnel, sloping downwards from the entrance, here approaches so near the water that an interval of only a foot or two is left between them. Beyond is darkness. What is to be done? Mr. Nobert Casteret when he made his first visit to the cave [1] answered this question by wading into the water until it reached his neck; he then "plunged" literally "into the unknown" and continued his journey by swimming under water. At length he found that the roof had risen and the water

[1] At that time the level of the water was higher, and at one place met the roof.

shallowed sufficiently to allow him once more to take to wading and so to attain the farther shore. Thus he obtained access to a virgin cave, trodden by no human foot since it was abandoned by the ancient hunters some 20,000 years ago or more. The next day he returned to the attack, but this time furnished with candles and matches in a waterproof packet. As he emerged from the water he lit his candle and looked around, "not without emotion," as he confesses, to see what was beyond. Evidently the gallery extended

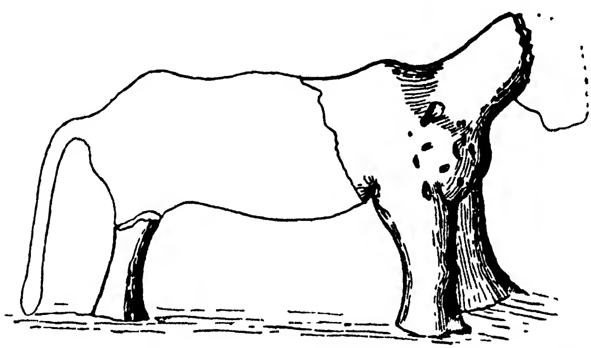

Fig. 368.—Model of a feline animal (? lioness) in the cave of Montespan. The breast and fore shoulder are pierced by wounds. (After Prof. Breuil.)

further, and he proceeded to explore its mysteries. On the walls he found incised outlines of animals—bisons, horses, stags, goats, chamois (izard), and hemione (Tibetan wild ass)—done in the style with which we are already familiar and of late Aurignacian or early Magdalenian age. We pass them by and hasten to the hall of statuary and sculptures in high relief, all of them modelled in clay. The first encountered is a much-damaged figure of some great feline animal, possibly a lioness; 1·6 m. in length and 0·7 m. in height. It was modelled against the wall of the cave, and so, although the greater part has fallen into ruin, a mark remains

upon the wall by which the original outline can be restored. (Fig. 368.)

The forepart, which still stands erect, has lost its head, which seems to have fallen off and now lies on the ground, a shapeless lump of clay.

Two other animals follow this, also modelled against the wall and in a still more hopeless state of decay.

A few paces farther on and we enter a little chamber—the "salle d'ours"—and in the middle of this, on a sort of platform prepared for it, is the sitting statue of a bear. The fore-paws are extended in front, and one of them shows clearly the digits and claws. This statue is also without a head, and the transverse section of the neck, with its smoothed and patinated surface, seems to show that the head was not an integral part of the model. Further, a hole driven into the middle of the section is suggestive of a peg upon which a head might be hung, and, still more remarkable, the actual skull of a young bear, such as would be appropriate to the model, was found lying between its fore-paws. Count Bégouen hence infers that the work was completed by the head of a real bear, and even supposes that during the performance of magical rites a realistic effect might have been obtained by clothing the model with a bear's pelt.

Near the bear is the outline of a horse, deeply incised in the clay which forms the floor of the cave and recalling the similar silhouettes of bisons met with on the floor of Tuc d'Audoubert (p. 398).

The remnants of many other animals, some modelled in high relief, are also found here upon the floor, as well as numerous little elongated mounds which seem to be models in the last stage of degradation. It would indeed appear, as Count Bégouen inclines to think, that the

whole floor of this chamber was once covered with representations of animals in clay; most of them have been washed away and only those which stood above the level of high floods have survived.

None of the statuary or sculpture in this cave of Montespan has any merit as a work of art. Detail is neglected and the modelling is crude to the last degree. The contrast between this and Tuc d'Audoubert is indeed surprising. Yet in both cases the animal representations served, no doubt, a similar end, *i. e.* the provision of food.

The bisons of Tuc d'Audoubert, a bull and a cow, assisted in magical rites to ensure fertility, to multiply the herds of bison and other game. The images of Montespan were their natural complement, their business was to ensure success in hunting the herds. This is clearly suggested by one feature which they all possess in common, *i. e.* the presence of numerous perforations such as would be produced by spear thrusts; they are jabbed all over with imaginary wounds, and no doubt the prayer of the hunter was that as he did this to their effigies so might he do to the living beasts themselves.

A tribute of respect is due to *The Illustrated London News*, which at a very early date recognised the importance of this discovery. An excellent account, accompanied by admirable illustrations, appears in its issue of November 3rd, 1923, under the title of " The Sculpture of the Cave Men "; it was followed on November 10th by another on " The Importance of the Montespan Discovery." This contained a translation from the French of an article by Count Bégouen, with additional illustrations by Mr. H. A. V. Coles.

A full account has now been given by Count Bégouen

et N. Casteret (*Revue Anthropologique*, 1923, xxxiii, pp. 533–545, 1 pl., " La Caverne de Montespan, Haute Garonne "), and some additional observations are recorded by Dr. L. Capitan (*Revue Anthropologique*, 1923, xxxiii, pp. 545–550, " Les manifestations ethnographiques et magiques sur les parois de la caverne de Montespan ").

ANCIENT HUNTERS AND THEIR MODERN REPRESENTATIVES

CHAPTER I

THE GREAT ICE AGE

THE changes which have affected the face of the earth since the dawn of recorded history are comparatively few and unimportant. In some regions, as in the British Isles, great tracts of forest and marsh have been replaced by cultivated land, and some few species of wild animals, such as wolves and bears, have been exterminated; but, so far as we can judge, the climate has remained the same, and no movements have permanently disturbed the level of the coast. The recent period seems to have been one of geological repose, affording a peaceful and stable arena for the great drama of human existence. The historian consequently may pursue his researches untroubled by disturbances of the environment, accepting the world as it now is, as that which, so far as he is concerned, has always been.[1]

[1] This is certainly true for Europe, but recent researches seem to show that it may not hold for all parts of the world. There is an extensive literature on the subject. E. Huntington, *Explorations in Turkestan*, Washington, 1905; *The Pulse of Asia*, Boston and New York, 1907; "The Climatic Factor as Illustrated in Arid America." Publication 192, *Carnegie Institution*, 1914; *Civilization and Climate*, 1915; Sven Hedin, *Scientific Results of a Journey in Central Asia*, 1899–1902, Stockholm, 1904–7, 6 vols., in particular vols. ii, iii, and iv; Sir M. A. Stein, *Geogr. Journ.*, 1909, xxxiv; *Ruins of Desert Cathay*, London, 1912, vols. i and ii; Wyman G. Bury, *The Land of Uz*, London, 1911, Preface by P. J. Maitland, p. xii:

But directly we extend our inquiries into antecedent periods, and endeavour to recall the story of our species from the unwritten past, we are conscious of a new régime: not constancy, but change seems to dominate the environment. The climate loses its stability; it swings slowly to and fro between extremes of heat and cold, of moisture and dryness, in long oscillations several times repeated. Harmoniously with these, successive assemblages of living forms—southern, temperate, northern—faunas of the forest, the tundra, and the steppe—make their appearance in the temperate European zone, disappear to reappear, and then finally vanish, either altogether or into remote regions of the earth.

Even the land itself ceases to maintain its solid firmness, but subsides over larger or smaller areas beneath the waters of the encroaching sea, or in some places rises to greater altitudes, and even shares in the increasing growth of mountain chains.

No doubt, in a retrospective glance, we are liable to a deceptive effect of perspective, and events widely separated in fact appear unduly crowded together by foreshortening. We are not, however, altogether without the means of making an appropriate correction for this illusion. The geological scale of time, though far from exact, is sufficiently so for the purpose, and, judged by this standard, the duration of the latest

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J. W. Gregory, *Geogr. Journ.*, 1914, xliii, pp. 293 ff.; "Cyrenaica," *Geogr. Journ.*, 1916, p. 337; O. Pettersson, "Climatic Variations in Historic and Prehistoric Time," *Svenska Hydrogr.-Biol. Komm. Skrifter, Heft* 5. H. H. Hildebrandsson, "Sur le prétendu changement du climat européen en temps historique," *Nova Acta Reg. Soc. Sci. Upsaliensis* (4), vol. iv, 1915; C. E. P. Brooks, "An Historical Notice of the Variations of Climate in Chile," *Washington Dept. Agr. U.S. Weather Bureau, Monthly Weather Rev.*, 1919, 47, p. 637; *The Evolution of Climate*, London, 1922, Cap. xvi; A. W. Rogers, "Post-Cretaceous Climates of South Africa," *South African Journ. Sci.*, vol. xix, p. 1, 1922.

epoch of terrestrial history, known as the Pleistocene, cannot have fallen far short of some three or four hundred thousands of years. It corresponds with the chief period of human development, and includes four complete oscillations of climate; one of them being of much longer duration than the rest.

The Great Ice Age.—Of the many changing elements which contribute to the geology of the Pleistocene epoch, climate is one of the most important, and to this, therefore, in the first place, we will turn our attention. The recent existence of a Great Ice Age was first divined by Schimper, the poet-naturalist, whose enthusiasm fired the imagination and stimulated the researches of the indefatigable Agassiz.

As a result of his investigations, Agassiz announced his belief that the earth had passed at no distant date through a period of extreme cold, when ice and snow enmantled a large part of its surface. Attempts, persisting even down to the present day, have been made to overturn or belittle this conclusion, but with very imperfect success, and it now stands more assured than ever. As the number of observers increases scarcely a year passes which does not bring some important discovery to bear additional testimony to its truth.

The evidence on which Agassiz based his views was derived, in the first instance, from a study of the Swiss glaciers and of the effects associated with their existence. The contemporaries of Agassiz—Forbes and Tyndall—and subsequent generations of scientific explorers have pursued their researches in the same region; and this land of lofty peaks, which has furnished inspiration to so many great discoverers in other branches of science, is thus pre-eminently classic ground for the

glacialist. Let us then commence our studies in the Alps, and, as a preliminary to further investigation. make ourselves acquainted with phenomena now alien to our land.

The Gorner Grat.—When Agassiz began his researches, glaciers were but little known, even to the travelled Englishman; now a crowd of summer visitors makes holiday upon them. It matters little to which of the many glacier systems we direct our attention; perhaps one of the best known is that which contributes to the astonishing panorama unfolded before us from the Gorner Grat (Plate I, Frontispiece). Dominating the scene is an array of majestic snowy peaks. On the extreme left stands the mighty complex mass of Monte Rosa, then the Breithorn; in front of us the Matterhorn rises in superb and isolated grandeur; farther to the right come the Dent Blanche, the Gabelhorn, the Rothhorn; and last, the shapely Weisshorn, which from some points of view, but not here, offers the most complete realisation of the ideal of mountain beauty.

Below lies a wide valley, filled deep with a mass of slowly flowing ice, fed by many tributaries pouring down from the broad snow-fields which sweep around and between the mountain fastnesses. Two main streams—the Grenz and the Gorner glaciers—unite on almost equal terms, and flow together as the Boden glacier, which comes to an end at the upper margin of the Hinter Wald, above Zermatt, where it melts away into the hurrying Visp.

Suppose now that by some magic wand we could wave away all these streams of ice, and dismantle the mountains of their snowy robes, leaving the rocks exposed and bare. A strange and wonderful landscape would then stand revealed; the valleys, as far up as the

ice had filled them, would be modelled in smooth and round and flowing outlines, in striking contrast to the rugged forms of the frost-splintered mountain summits. Angular fragments of rock, some of them very large, the remnants of the lateral moraines, would lie scattered over the valley sides, marking the line where the glacier had lapped against its banks; and a heap of débris, confusedly piled together, would stretch across the valley in a broken crescentic mound, like the ruins of a great natural dam. This is the terminal moraine, and marks the end of the vanished glacier. Behind

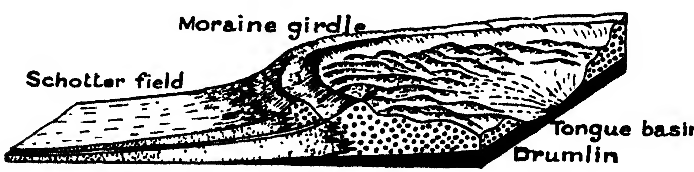

FIG. 1.—The features left at the end of a vanished glacier. (After Penck and Brückner.)

it we might see a basin-like depression, in which the glacier had sunk itself by abrasion[1] (Fig. 1); and within this, rising from its surface, elongated hummocks, or drumlins, of boulder clay. These radiate from the centre of the basin outwards, streaming like a swarm of fishes swimming against a current. They record the stream-lines of the once flowing ice.

When we have gazed on the desolate scene long enough to distinguish its principal features, we will descend from our eyrie and examine them more in detail. The smoothness of rounded outline which we have already remarked is found to be due to the

[1] This seems to follow from the detailed mapping of the Swiss lakes and their surroundings by Profs. Penck and Brückner, but the glacial origin of lakes is still disputed by Prof. Bonney and others.

abrasive action of the glacier, which has ground away all the asperities of its bed; crags and jutting rocks have been worn down into rounded bosses (roches moutonnées) (Fig. 2), the smooth surfaces of which are striated by grooves and scratches all running in the same direction as that once taken by the glacier in its flow.

The drumlins consist of a tough clay, crowded with stones of all sorts and sizes, but bearing very remarkable features by which they are readily distinguished.

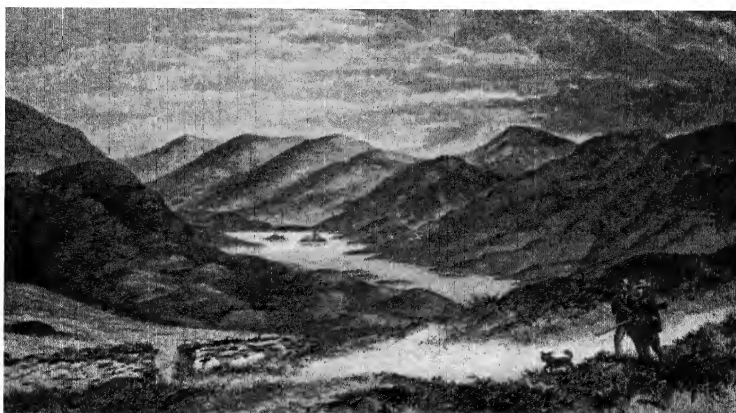

Fig. 2.—Roches Moutonnées around Loch Doon. (After James Geikie.)

Originally angular fragments, they are now subangular, their sharp edges and corners having been ground away and rounded off by the ice; their flattened faces are smoothed and polished, and covered with scratches which run in parallel groups, generally in the direction of the longest axis of the stone, but occasionally across it (Fig. 3). The whole assemblage of scratched stones and clay is known as till or boulder clay.

Such, then, are the signs which would be left behind on the disappearance of the ice.

It requires no magic wand to bring about the transformation we have imagined; an amelioration of climate will suffice. Even at the present time the Boden glacier, like so many other great glaciers in Switzerland, is diminishing in bulk; its surface, instead of bulging up, is sagging in like an empty paunch, since the annual snowfall is insufficient to make good the annual loss due to melting away. A general rise of temperature over Switzerland to the extent of 4° or 5° C. would drive the snow-line high up the mountain peaks, and all the glaciers would disappear.

FIG. 3.—A Glaciated Boulder. (After James Geikie.)

Effects of Refrigeration.—Let us now suppose that the climate, instead of ameliorating, grows gradually more severe. The Boden glacier will be more richly replenished by its tributaries; it will bulge upwards and downwards, and descend farther into the valley of the Visp; if the mean annual temperature falls low enough—say, 5° C. below the present—it will extend downwards till it reaches the valley of the Rhône. All the glaciers which lie in valleys tributary to the Rhône will similarly enlarge, as will the glacier of the Rhône itself.

The Rhône Valley.—If, bearing this possibility in mind, we walk down the valley of the Visp, we shall discover on every side signs of an ancient extension of

the ice, and on the most stupendous scale. The swollen Visp glacier evidently soon became confluent with that which filled the Sass-tal, and their united volume then entered the glacier of the Rhône. This, which now ends close to the Furca, had then already attained there a thickness of some 5000 ft., and overflowed the Grimsel pass (Fig. 4). Farther down, where the Sasser-Visp glacier entered, it was even thicker. Filling the valley, it pursued its course past the bend at Martigny, and emerged from the Alps to overwhelm, in a great fan-shaped expansion, all the region now occupied by the lakes of Geneva and Neuchâtel; it rose against the

Fig. 4.—Diagram to show the ancient extension of the Rhône glacier. If the line pointing to the Col du Grimsel be prolonged downwards, it will meet the termination of the present glacier of the Rhône. (After De Lapparent.)

flanks of the Jura to a height which shows it to have possessed, even at this distance from its source, a thickness of over 3000 ft. But it did not terminate here; it traversed the Jura, and debouched on the plains of France (Fig. 4). There it deposited its terminal moraine, which runs in a much-indented, but on the whole crescentic, line from Vienne, through Lyons, past Villefranche, to Villereversure, Arlay, Mesnay, Morteau, till it re-enters Swiss territory, between Maiche and Seignelegier, to become continuous farther on with the similar moraine of the great Rhine glacier (Fig. 5).

Switzerland in the Ice Age.—As might well be supposed, this increase in volume was not confined to the glaciers

of the Rhône valley. All the glaciers of Switzerland were affected in a corresponding degree; and the whole of this territory, now dotted over with number-

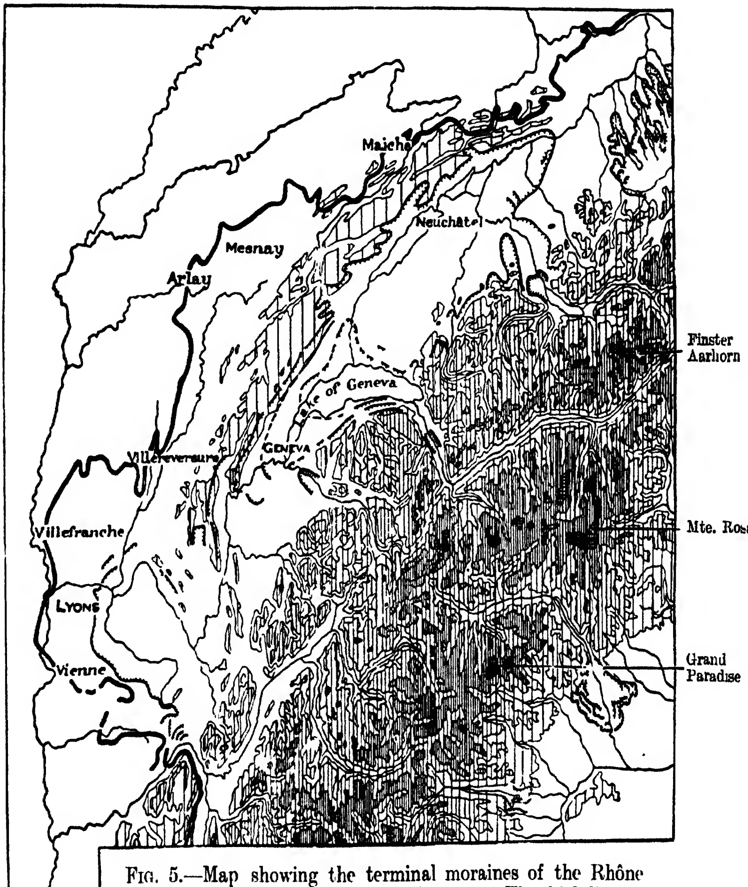

Fig. 5.—Map showing the terminal moraines of the Rhône glacier, formed during the Great Ice Age. The thick line ▬ marks the moraine of the 3rd glacial episode, the thinner line — within it the moraine of the 4th glacial episode. (After Penck and Brückner.) Vertical lines, widely separated, 500—1500 m.; closer, 1500—2500 m.; closest, 2500 - 3500 m.; criss-crossed, over 3500 m.

less farms and villages and with great towns like Zurich and Geneva, was buried beneath a continuous sheet of snow and ice.

The Ice Sheet of Northern Europe.—It is not necessary to visit Switzerland to become familiar with the signs left by the ancient ice of the Glacial epoch; they surround us on every hand at home, and are amongst the commonest features of the mountainous parts of our land. Smoothed and striated surfaces, boulder clay and superficial morainic material, testify to the passage of the ice, indicate its direction, afford evidence of its thickness, and mark its boundaries. If we follow the southern boundary of the ice, we shall find that it will take us out of Britain and lead us right across the continent of Europe (Fig. 6). After stretching from Kerry to Wexford, and through the Bristol Channel to London, it crosses the sea, continues its course through Antwerp, past Magdeburg, Cracow and Kiev, runs south of Moscow to Kazan, and then terminates at the southern end of the Ural mountains. All that lies to the north of this line—the greater part of the British Isles, Northern Germany, Scandinavia, and almost the whole of European Russia—was buried out of sight beneath a mantle of ice formed by the confluence of many colossal glaciers.[1]

The Ice Sheet of North America.—At the same time a large part of North America was overwhelmed (Fig. 7). The great terminal moraine which marks the southern boundary of the ice can be traced, with occasional interruptions, from Nantucket through Long Island past New York, towards the western extremity of Lake Erie, then along a sinuous course in the same direction as the Ohio, down to its confluence with the Mississippi; then it follows the Missouri as far as

[1] According to one school of geologists, represented in this country by Professor Bonney, the British area and Northern Germany were partly submerged beneath the sea, and much of the glaciation they experienced was due to floating ice.

central area situated in and about the region of Hudson Bay.[1]

The co-existence of two continental ice-caps, one on each side of the Atlantic Ocean, is a sufficiently impressive fact, and that the Ocean itself enjoyed no immunity from the rigours of the time is shown by the discovery of boulders, which appear to have been carried by ice, in close proximity to the Azores (about lat. 38° N.).[2] A review of the evidence may fairly lead us to conclude that a general lowering of the temperature, probably to the extent of about 5° C., affected the whole of that part of the Northern hemisphere which lies outside the Tropic of Cancer.

Ancient Glaciation in the Southern Hemisphere.—A similar fall of temperature seems to have affected the Southern hemisphere. If we turn to our antipodes we discover obvious signs of the former existence of glaciers in the Kosciusko plateau or Muniong range of New South Wales (lat. 36° 22′ S., height 7328 ft.). The snow-fields on the watershed gave birth to glaciers which flowed down the valleys on each side; to the west to a level of at most 6300 ft., to the east of 5800 or perhaps 5500 ft. The largest of these glaciers was only a few hundred feet in thickness and three miles in length.[3] The facts observed in the Kosciusko plateau indicate a former lowering of the snow-line to the extent of 2200 to 2700 ft.

In Tasmania, the former existence of Pleistocene

[1] F. Leverett, "Comparison of North American and European Glacial Deposits," *Zeit. f. Gletscherkunde*, 1901, iv, pp. 241–316, pls.

[2] De Geer, *Om Skandinaviens Geografiska Utveckling efter Istiden*: Stockholm, 1896, p. 41.

[3] David, Helms, and Pitman, "Geological Notes on Kosciusko, with special reference to Evidence of Glacial Action," *Proc. Linn. Soc. N.S.W.*, 1901, pp. 26–74, plates. This memoir contains a valuable bibliography on the Pleistocene glaciation of the Southern hemisphere.

glaciers has long been known,[1] and they point to a lowering of the snow-line to the extent of 4000 ft.

New Zealand differs from Australia and Tasmania, inasmuch as many great glaciers still move down the valleys of its lofty mountains, the Southern Alps, and reach in some cases to within 610 ft. of the existing sea; but it presents similar evidence of an ancient extension of the ice, and of a lowering of the snow-line by some 3000 or 4000 ft.

After a careful consideration of all facts, Penck concludes that the descent of the snow-line during the Glacial epoch was approximately the same in both hemispheres, *i.e.* between 3000 and 4000 ft.[2]

So far no indications of a Pleistocene glaciation have been observed in South Africa,[3] but the southernmost extremity of the Cape lies north of Mount Kosciusko, the most northerly point of Australia at which glacial markings have been recognised, so that this perhaps is only what might have been expected; but in South America, which extends farther towards the Pole, they are once more manifest; boulder clay and erratic blocks are widely distributed over the plains of Tierra del Fuego and South Patagonia. After a survey of the evidence Moreno remarks: "In Patagonia an immense

[1] T. B. Moore, "Discovery of Glaciation in the Vicinity of Mount Tyndall, etc.," *Papers and Proc. R. Soc. Tasmania* for 1893, pp. 147-9 (1894), and "Notes on Further Proofs of Glaciation at Lower Levels," *op. cit.* (1896), pp. 73-7. The latest work on the subject is by J. W. Gregory, "A Contribution to the Glacial Geology of Tasmania," *Quart. Journ. Geol. Soc.*, 1904, lx, pp. 37-53, plates. At the close of this paper are some remarks by Prof. Kendall, who considers that the evidence points to glaciation by ice-sheets, not valley glaciers, and calls attention to the fact that the ice came down to within a few hundred feet of the sea level in a latitude corresponding to that of Madrid.

[2] Penck, "Die Eiszeit Australiens," *Zeits. d. Ges. f. Erdk. z. Berlin*, 1900, xxxv, pp. 239-86, map.

[3] A. W. Rogers, *op. cit.*, p. 16. The statement that the higher summits of the Drakensberg mountains bear signs of glaciation (C. E. P. Brooks, *op. cit.*, p. 103) rests upon some error of observation.

ice-sheet extended to the present Atlantic coast, and farther east, during the first ice period; while, during the second, terminal moraines . . [were] . . left as far as thirty miles north and fifty miles south to the east of the present crest of the Cordillera." [1] And Steinmann, in summarising the results of his observations, remarks: "Where the ice extended over the plain in a great *mer de glace*, as far as the Strait of Magellan, the glacial formations correspond with those of North Germany or the lake region of North America. Where it flowed through deep valleys into the sea, as in the Patagonian Archipelago, it repeats the fjord landscape of Norway or Alaska. In the well-watered parts of the Cordillera of Central Patagonia and South Chili, marginal lakes occur, with the same characters as those of the Swiss Alps, bordered by terminal moraines of no great height." [2]

Ancient Glaciation in the Tropics.—If the temperate regions of both hemispheres experienced a lowering of temperature at all approaching 5° C. the tropics themselves could scarcely remain unaffected, and we might expect to find some signs of a colder climate even in the torrid zone. Though these signs are to be sought in regions which are difficult of access and rarely visited by skilled observers, yet an increasing body of evidence shows that they actually exist. In South America "traces left by the Ice Age extend along the whole mountain chain from Cape Horn (lat. 56° S.) up to the Sierra Nevada de Santa Maria (lat. 11° N.).[3] On Mount Tacora (lat. 17° 30′ S.), the summit of which just reaches the snow-line (19,965 ft.), terminal moraines

[1] F. B. Moreno, *Geogr. Journ.*, 1899, xiv, pp. 241–69 and 353–78.
[2] Steinmann, "Ueber Diluvium in Süd-America," *Zeits. d. Deutsch. Geol. Ges.*, 1906, lviii, p. 215.
[3] Steinmann, *op. cit.*

have been traced down to a level of 13779 ft.; Mount Tunari, situated in the more richly watered East Cordillera in about the same latitude (17° 10′), reaches the snow-line at about 17,000 ft., and its ancient terminal moraines extend down to 9842 ft., or 8210 ft. below the snow-line.

The Himálaya and Karakorum, situated, it is true, outside the tropics, afford concordant testimony; thus in the latest account of these regions we are informed that the existing glaciers, though large and numerous, are but the relics of an older series of ice-flows. The ancient moraines, the perched blocks, and the glaciated surfaces all furnish proofs that the ice in former times covered an area in Asia immensely larger than at present.

On the southern slopes of the Dhauladhar range an old moraine was discovered by the late General McMahon at the extraordinarily low altitude of 4700 ft.; and on the Tibetan side of the great Himálayan range the glaciation appears at one time to have been almost universal. No trustworthy observations have yet been made in Central or Northern Tibet, but in Ladak, in Nari Khorsam and in Tsang, according to Burrard and Hayden, "the vast moraines and the transported blocks, perched high on hillsides far from their parent mass, are indications of the former existence in Southern Tibet of an almost continuous ice-sheet, and of snow-fields and glaciers such as are now to be found in polar regions only."[1]

The best register, however, of a former glacial climate within the tropics is afforded by the solitary Mount Kenya (19,500 ft.), which rises only half a degree south

[1] Burrard and Hayden, *A Sketch of the Geography and Geology of the Himalaya Mountains and Tibet*, 1907, part iii, p. 192.

of the equator. The glaciers which now flow down its slopes terminate at a height of about 15,400 ft., but the ancient ice extended at least 5400 ft. lower down, for a terminal moraine has been observed at 10,000 ft. and erratics have been traced down to 9800 ft.[1] Similar evidence is afforded by Mount Ruwenzori [2] and Mount Kilimanjaro.[3]

The Whole World was Affected by the Glacial Climate.[4]—Thus, to whatever region we turn, our inquiries elicit the same facts. Alike in Northern Europe and Southern Australia, in the Peruvian Andes or the isolated cones of Central Africa, the evidence points to a considerable lowering of temperature in comparatively recent times, corresponding with the last Glacial epoch. Thus the Great Ice Age clearly deserves its name; it affected the whole of our planet, and can scarcely have failed to influence in a high degree the history of its inhabitants.

Oscillations of Climate.—Of late years investigations bearing, if possible, even more immediately on our subject, have been directed to the succession of events, or the inner history, of the Glacial epoch.

In the British Isles the mountains are so inconsiderable, and the volume of the ice was so great, that secondary effects are lost in the general result, and detailed research is conducted under exceptional difficulties. In the Eastern Alps, on the other hand, both the relief of the ground and the magnitude of the glaciers are such as

[1] J. W. Gregory, "The Glacial Geology of Mount Kenia," *Quart. Journ. Geol. Soc.*, 1894, l, p. 521.

[2] J. W. Gregory, "The Geology of Mount Ruwenzori, 1895," *Quart. Journ. Geol. Soc.*, 1895, li, p. 676.

[3] H. Meyer, *Ostafrikanische Gletscherfahrten*.

[4] The preceding account of the Great Ice Age had for one of its chief objects the establishment of this thesis at a time when it was not generally accepted. Recent research has added many new facts in its support. For additional details see C. E. P. Brooks, *op. cit.*

seem to promise a ready response to fluctuations of temperature, and this under conditions favourable to a permanent record of their effects. Nature seems, indeed, to provide in them a delicate registering thermometer. It was in this way, at least, that they appealed to the sagacity of Prof. Penck,[1] one of the most distinguished investigators of glacial phenomena at the present day; and it was on the Eastern Alps, therefore, that he first concentrated his attention. Let us follow him into this region.

River Terraces.—The accompanying illustration (Plate II), which I owe to the kindness of Prof. Penck, represents one side of the valley of the Steyr. On close examination it will be seen to display a number of parallel terraces, almost horizontal, and running with great regularity in the same direction as the valley. The lowest of these terraces (*w*) forms a broad field through which runs the poplar-bordered road from Steyr to Sierning: it descends to the river by a steep slope, about 50 ft. in height. Nearly 70 ft. above it, the surface of the second terrace (*r*) is seen; one of the characteristic farmhouses of Upper Austria stands upon this. Immediately behind it follows the third terrace (*m*), and above this again the highest terrace (*g*), which broadens out into a wide plateau. Such terraces are not confined to the valley of the Steyr; they are common in many of the great valleys of the Eastern Alps, of the Western Alps also; they occur very generally over Europe, and indeed in all the glaciated regions of the globe.

The terraces can be traced down the valley of the Steyr into the valley of the Enns, and then onwards

[1] A. Penck and E. Brückner, *Die Alpen im Eiszeitalter*, 8vo. Leipzig, 1901–1909, three volumes.

[To face p. 18.

PLATE II.—THE VALLEY OF THE STEYR.

towards the Danube; two of them, indeed, the uppermost and lowermost, actually reach the bank of this stream. They can also be traced upwards towards the mountains, extending with considerable interruptions, over a course of forty or fifty miles. The pits, which are dug into them here and there, afford an insight into their structure and composition. Entering one of these, we observe beds very much resembling gravel, very coarse, and cleanly washed, made up of pebbles varying from about 2 in. to 6 in. in diameter. On the whole they are rather evenly stratified, though sometimes they form oblique layers (false bedding), and include occasionally lenticular patches of sand or loam. To these deposits the Germans give the name of shotter (*schotter*), a term we shall find it convenient to adopt. The shotter have evidently been deposited by swiftly running water; they mark the course of a rapid river.

We may now follow the terraces up the valley, and this time we will select the valley of the Iller. The terraces broaden out to wide sheets, and then become replaced by features of a totally different character. We are now introduced to an irregular assemblage of hills, which extend, not like the terraces, along the valley parallel with its length, but transversely across it, running in a gentle curve convex downwards. They may be overgrown by forests of firs or covered with soft green turf, but natural or artificial sections will somewhere expose their structure. This is very different from that of the river terraces; instead of rounded pebbles we find angular fragments of rock and an occasional striated boulder; the stones are of all sizes and of very diverse kinds, fine sand and mud are intermingled with them, and all are thrown together in confusion, with no trace of order or arrangement. These

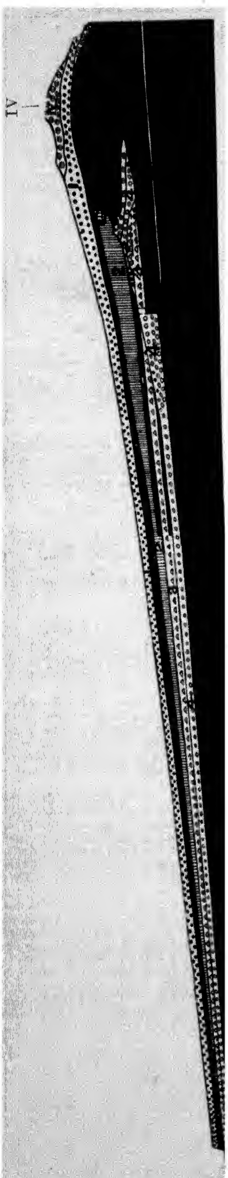

FIG. 8.—The four terraces of the Iller (1, 2, 3, 4) and their corresponding moraines (I, II, III, IV). (After Penck and Brückner.)

are the characters of a terminal moraine. Here an ancient glacier of the Iller came to an end.

A question of capital interest now presents itself: What are the relations, if any, between the terrace and the moraine?

The answer to this has been given by Penck, who has shown that the river terrace loses itself in the moraine; the two meet and interdigitate with each other, as shown in the diagrams (Figs. 1 and 8).

Where the glacier gave birth to a river, there the moraine passes into a terrace.

As there are four terraces, so there are four moraines, one to each terrace.

A consideration of these facts leads to very important consequences. In attempting an explanation let us begin with the first or highest terrace. To account for the formation of the thick sheet of shotter it represents, we must assume the existence of a river so heavily overburdened with detritus, that it had little or no power to erode; it could carry away the material of the moraine, round the angular fragments into well-worn pebbles, and distribute them far and wide over its valley floor,

but it could not deepen its channel. Its energy was restricted to building up a sheet of shotter, over a hundred feet in thickness, which stretched from side to side of the river valley. This sheet of shotter represents the first stage in the formation of the terrace (*a*, Fig. 9).

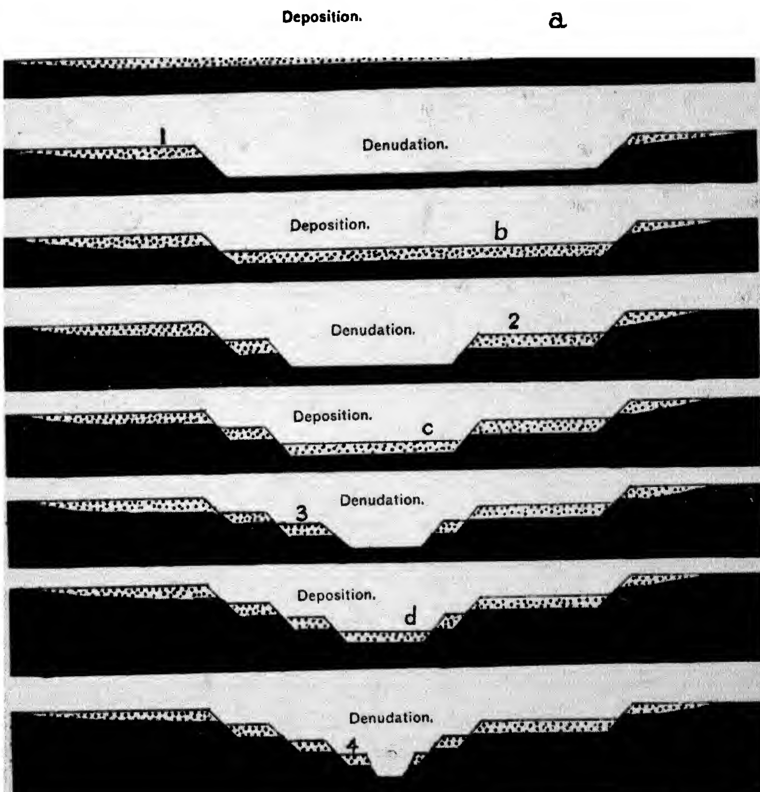

Fig. 9.—Diagram to show the formation of river terraces in the Alps.

Of the sheet so formed only the first terrace, a mere remnant, a narrow selvage, now exists, lining the side of the valley; the river which previously deposited it has since carried the greater part of it away. It seems natural to assume that the river had acquired a higher

degree of activity, probably as a consequence of increased velocity; and its enhanced power is still further shown by the fact that after removing the shotter it was able to wear its way down into the harder rocks beneath, and has actually deepened its valley. Thus the terrace was cut out during a period of erosion which followed upon a period of deposition (*b*, Fig. 9).

The second terrace involves a similar succession of events; it points to a return to the earlier conditions, when the river, powerless to erode, spread out a second sheet of shotter over the newly excavated valley floor (*c*, Fig. 9); then came renewed activity, and the second terrace was carved out. The same is true of the third and fourth terraces, and thus we have repeated, time after time, an alternation of periods of deposition and periods of erosion. Such are the immediate inferences from the facts.

We must now take a step further, and attempt to account for this alternation of processes.[1]

The interdigitation of the terrace with its moraine shows that the terrace, or rather the sheet of shotter from which it was carved out, was deposited during an interval when the glacier was comparatively stationary, *i. e.* during an interval in which it built up its terminal moraine. But when a glacier is stationary the amount of water discharged from it is comparatively small, the annual discharge is indeed precisely equal to the annual snowfall by which the glacier is replenished. When the glacier is advancing the discharge is even less. Under these circumstances the resulting river would be scarcely larger than the corresponding river which

[1] In order to preserve the historical continuity of our argument we give here the explanation advanced by Penck. Later on we shall recur to this question.

now represents it, and its power to erode was at a minimum.

If now we are to endow this river with greater volume and velocity we must assume that the glacier commenced a retreat, or in other words that more ice was melted away from it than was made good by the annual snowfall; and this retreat must have continued for no inconsiderable period—it must have lasted at least as long as was necessary for the sweeping away of the previously deposited shotter and the deepening of the valley.

Thus, if this reasoning be valid, we are led to greatly enlarge our conception of the Glacial epoch: it was evidently no unbroken reign of ice, it was not a single episode, but a repeated alternation of contrasted episodes. There were periods of predominant snowfall, when the ice attained its maximum development, and the rivers were impoverished; and alternating with these were periods of predominant rainfall, when the accumulated ice of centuries melted away, and, adding its volume to the general drainage, gave birth to swollen streams far surpassing in magnitude those with which we are familiar in the existing Alps.

The great ebb and flow of temperature was at least four times repeated; four times have the glaciers enlarged their bounds, and four times have they been driven back into their mountain home.

Hypothesis.—Such then is the hypothesis which arises from our contemplation of the river terraces; there is much that is attractive about it, and it has the additional advantage of explaining the facts, so far as they are known. Yet we must not omit to point out that its author, Prof. Penck, admits it was suggested by the

by the theory of Adhemar, as advocated by Croll. At the present day, however, there are few who accept the theory of Adhemar, and consequently the explanation is discredited at its source.

Must we for that reason reject it? By no means: we shall not condemn the prisoner at the bar on account of his pedigree, or because he has been convicted of a previous offence. At the same time, in making an

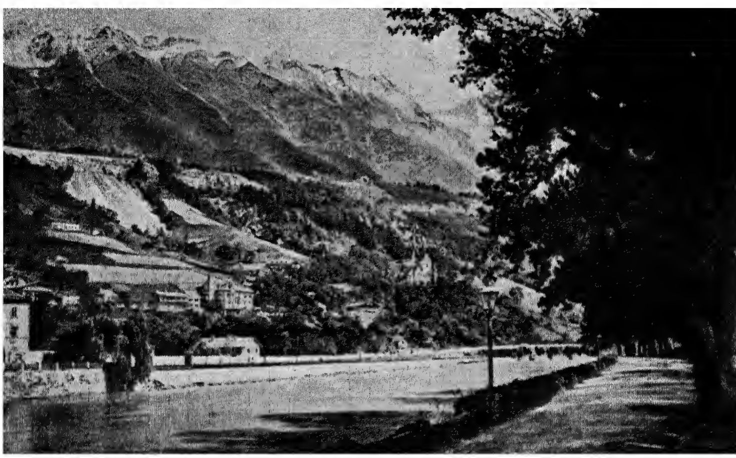

FIG. 10.—View from the promenade along the Inn at Innsbruck, showing the Hötting breccia on the other side of the valley.

unprejudiced inquiry into the case, we shall be more than usually exacting in our demand for proofs.

We will therefore inquire whether there is any independent evidence in favour of these supposed inter-glacial or genial periods. It would seem that there is.

Hötting Breccia.[1]—Every one, at least every geologist, who has visited Innsbruck, that delightful starting-place for the mountains, is familiar with the peculiar red

[1] Penck and Brückner, *op. cit.*, pp. 383, *et seq.*

stone which is so much used there for building. It comes from some neighbouring quarries situated on the northern slope of the Inn valley, near the village of Hötting. By walking down to the promenade along the side of the river we shall obtain a good general view (Fig. 10). The breccia is seen, at the height of about 500 ft. above the bottom of the valley, as an almost horizontal band, several hundred feet in thickness, and very conspicuous owing to the contrast of its reddish colour with the dark blue rock beneath; its course can be plainly traced by the heaps of waste stone thrown out from the workings along its face. Crossing the bridge,

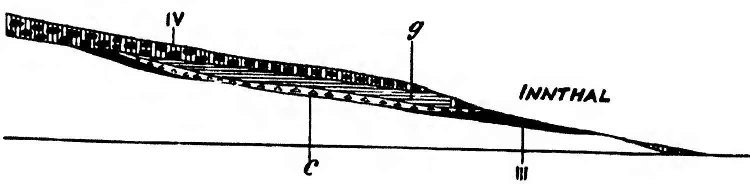

FIG. 11.— Diagrammatic section showing the Hötting breccia (*c*) between the boulder clay of the last Glacial episode (IV) and that of the last Glacial episode but one (III). (*g*) terrace gravels. (After Penck and Brückner.)

a short walk takes us to the quarries. The breccia is then found to consist for the most part of fragments of a dark grey dolomitic limestone, cemented together by a reddish marly matrix, and the deposit is such as might result from the consolidation of the débris brought down by a mountain torrent. The rock on which it rests is a dark blue clay containing obviously scratched glacial boulders; it is a true boulder clay, and represents a moraine of the third Glacial episode. Since the breccia overlies this, it must be of later date. But higher up, at a height of about 2500 to 3000 ft., we encounter a second deposit of boulder clay, a moraine formed during the fourth or last Glacial episode (Fig. 11):

This rests directly upon the smooth surface of the breccia, which must consequently be of earlier date.

Thus the breccia is older than the last Glacial episode, and younger than the last but one,[1] and may provisionally be regarded as filling the interval between them—*i.e.* it represents a hypothetical interglacial or genial epoch.

Taken by itself the evidence we have so far offered is not sufficient to establish so important a conclusion, but fortunately it does not stand alone. The Hötting breccia is fossiliferous, and has yielded a number of leaves and other remains of plants: these fossils are indeed fairly common, and the visitor who should fail to find at least a few examples would be singularly unfortunate. No less than forty-two species have been identified;[2] they include among others the fir (*Pinus sylvestris*), spruce (*Picea sp.*), maple (*Acer pseudoplatanus*), buckthorn (*Rhamnus frangula*), several willows (*Salix nigricans, S. glabra, S. incana, S. triandra*), the wayfaring tree (*Viburnum lantana*), yew (*Taxus baccata*), elm (*Ulmus campestris*), strawberry (*Fragaria vesca*), self-heal (*Prunella vulgaris*), beech (*Fagus silvatica*), and mountain ash (*Sorbus aucuparia*). None of these or of any of the remaining species are of distinctly boreal or alpine type.

Three of the most important plants we have reserved for special mention: they are a new species of buckthorn, *Rhamnus Hoettingensis*, related most closely to *R. latifolia*, now living in the Canary Isles, the box (*Buxus sempervirens*), also a southern species; and most important of all (Fig. 12) a rhododendron (*R. ponticum*), which

[1] Penck and Brückner are now inclined to place it a stage earlier, between the second and third glaciations. *Op. cit.*, p. 1157.

[2] There is an important literature on this flora; we may mention in particular R. von Wettstein, "Die Fossile Flora der Höttingen Breccie," *Denksch. matt. natur. wiss. cl. Kk. Ak. Wien*, lix, 1892, pp. 1–48, 7 pls.

now lives in the Caucasus, five degrees south of the latitude of Innsbruck, and in a climate on the average 3° C. warmer (Fig. 13). Taking all the facts into consideration Penck concludes that the climate of Innsbruck in the days of the Hötting breccia was 2° C. warmer than it is now : in correspondence with this the snow-line stood 1000 ft. above its present level, and

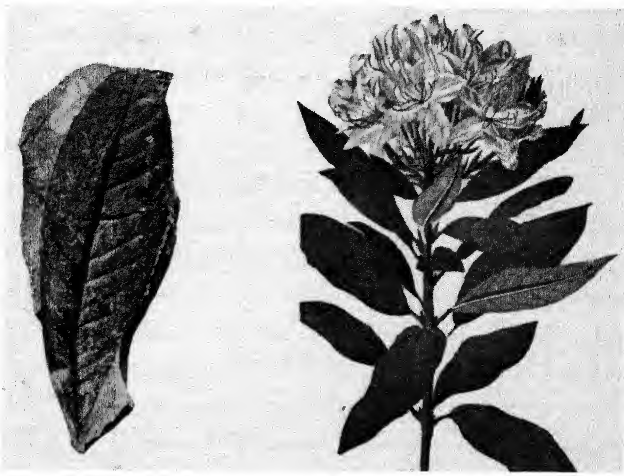

FIG. 12.—Fossil leaf of *Rhododendron ponticum* from the Hötting breccia. (After v. Wettstein.)

FIG. 13.—A flowering branch of the existing *Rhododendron ponticum* from the Caucasus.

the Alps, save for the higher peaks, were almost completely denuded of ice and snow.

The region round Hötting thus furnishes us with evidence of revolutions of climate on the grandest scale; the lower boulder clay, representing the third Glacial age, witnesses to a time when the snow-line of the Alps had descended 4000 ft. below its existing level, and the valley of the Inn was filled with ice; the Hötting breccia, representing the third genial age,

equally testifies to a time when the ice had disappeared and the mountains had been relieved of their mantle of snow, when also a varied forest growth, thickets of the Pontic rhododendron, and a multitude of flowering annuals covered the bare rocks, and adorned the dreary expanses of boulder clay; the upper boulder clay, representing the fourth and last Glacial age, witnesses to a final advance of the ice, when the snow-line again crept down to its previous level, 5,000 ft. below that of the Hötting interval, and glaciers overflowed the forests of the Inn.

It is fortunate for our argument that the advancing ice did not sweep away and destroy the Hötting breccia, as it has destroyed in all probability a great number of similar deposits. A few other instances of undoubted interglacial beds do, however, exist- notably that of Dürnten, in the neighbourhood of Zurich—and these afford almost equally cogent testimony.[1]

In the light of these facts the imaginary sequence of events suggested by the river terraces acquires a greater appearance of reality, so much so that we may now make use of these features in our subsequent inquiries.

The four terraces are ruled, as it were, across the last page of terrestrial history; they are datum lines, which enable us to divide the Pleistocene or Quaternary epoch into seven ages, the first, second, third, and fourth Glacial ages, with their three intervening genial ages.

[1] Penck and Brückner mention the Schiefer-kohlen of Mörschwy on the Bodensee (p. 420), the Schiefer-kohlen of Dürnten and Wetzikon (p. 581), the plant-bearing clay of Re in the Vigezzo valley (p. 816), and especially the Pianico beds of the Iseo valley (p. 830), as other instances of interglacial deposits. *Die Alpen im Eiszeitalter*, Leipzig, 1909.

The universality of genial episodes is still disputed by some; thus on a review of the evidence Lamplugh is convinced that not more than one of these episodes occurred in the British area, and is inclined to think that the evidence for even this is doubtful. G. W. Lamplugh, Presidential Address to the British Association, Section C, York, 1906, pp. 532–558.

We are thus provided with a chronological scale to which we can refer the more important events in the early history of the human race.

So far Penck. But we are not yet at the end of our inquiry, there still remains an important question to which we promised to recur: that is the mode of origin and formation of the river terraces.

We have already traced them upwards to their association with moraines. Let us now turn away from the mountains and follow them down the valley to the sea. As we do so we soon perceive that they preserve a remarkable parallelism in their descent, both to one another and to the river which flows below. This is a feature which may be verified by measurement.

It is, however, where they make their nearest approach to the sea and come to an end that a genuine surprise awaits us, for we find that their respective heights above the sea are here very much the same as they are above the river.

The great pioneer in this inquiry was General de Lamothe,[1] who began by measuring the heights of the terraces of the river Isser in Algeria at their seaward termination.

He obtained the following results:

Terrace.	Height above sea level.
No. 1.	93 to 95 m.
,, 2.	55 to 57 m.
,, 3.	28 to 30 m.
,, 4.	15 to 16 m.

This in itself is a very remarkable fact, for rivers deposit the material which forms their terraces at or about their own level, so that the uppermost terrace of

[1] L. de Lamothe: "Note sur les anciennes Plages et Terrasses du Bassin de l'Isser et de quelques autres Bassins de la Côte Algérienne," *Bull. Soc. Géol. de France*, sér. 3, Tome xxvii, pp. 257-303, one pl., 1899.

the Isser shows that the river, to which it owes its existence, was flowing at the time of its formation at or about 100 m. above the sea level on its arrival at the sea-coast.

If then the sea at that time stood at its present level the river must have discharged into it by rapids, cataracts, or even perhaps by a waterfall.

But, as we know, well-established rivers, and such are now the rule, flow smoothly into the sea at their own level.

This consideration might perhaps lead us to hazard, among others, the guess that not only the river but the sea also stood 100 m. higher at the time the terrace was in process of formation than it does to-day.

That changes in the relative level of land and sea have taken place not only in the remote past but even in historic times is well known. Where such changes do occur the event is recorded by some mark left by the sea upon the land, usually a raised sea-beach.

Evidently we must now leave the valley and examine the coast. This is precisely what General Lamothe did, and as a result he discovered four ancient platforms composed of marine littoral deposits which extended horizontally, one above the other, for great distances, bordering the coast.

The next step was to determine their heights. They were found to be as follows:

Shore-line.	Height.
No. 1.	98 to 100 m.
,, 2.	55 m.
,, 3.	30 m.
,, 4.	15 to 17 m.

The agreement with the river terraces is complete (p. 29), and thus what we first proposed as a conjecture is now established as a fact.

General de Lamothe was so impressed by the constancy in height maintained by these ancient shore-lines over long distances that he felt compelled to assume, not an elevation of the land, but a sinking of the sea-level.

On this question there is room for a difference of opinion,[1] but it is manifest that a sinking of the sea-level could not occur off the coast of Algeria without affecting the whole of the Mediterranean Sea; probably also the Atlantic Ocean and the Pacific as well. This led General de Lamothe to conclude that similar shore-lines corresponding to those he had observed on the southern coast should also be met with on the northern coast of the Mediterranean, and he predicted in particular that they would be found in Provence. This prediction was afterwards verified by Prof. Depéret, who found that the four terraces of the Rhône which correspond in height with those of the Isser are likewise associated with four marine shore-lines, each to each, at their seaward termination.

Subsequent investigations have shown that four terraces, closely approximate in height with those of the Isser, characterise the valleys of many other European rivers, such as the Rhine, the Danube, the Garonne, the Moselle, the Somme, and the Loire (Fig. 14).[2] At the

[1] That the land was not exempt from movement is shown by the fact, pointed out by Prof. Depéret, that the coast-line of 30 m. stands at 100 m. in the Strait of Messina, and in the Isthmus of Corinth even reaches 300 m. We shall use the expressions "rise of the land" or "fall of the sea" indifferently, as expressing the same fact.

[2] L. de Lamothe, "Sur le rôle des oscillations eustatiques . . . dans la formation des systèmes de terrasses de quelques vallées," *C. R.*, tome 132, 1901, p. 1428 f.; *ibid.* "Les anciennes lignes de rivage du bassin de la Somme, *C. R.*, tome 162, 1916, pp. 948 f.; *ibid.* "Les anciennes nappes alluviales et lignes de rivage du bassin de la Somme et leurs rapports avec celles de la Méditerranée Occidentale," *Bull. Soc. Géol. de France*, sér. 4, tome xviii, 1918, pp. 3 ff.

E. Chaput, "Observations sur les terrasses alluviales de la Loire et de ses principaux affluents," *Ann. l'Univ. Lyon*, n.s., vol. i; 306 pp., 1917; and "Observations sur les alluvions anciennes de la Seine"; *C. R.*, tome 172, p. 118, 1921.

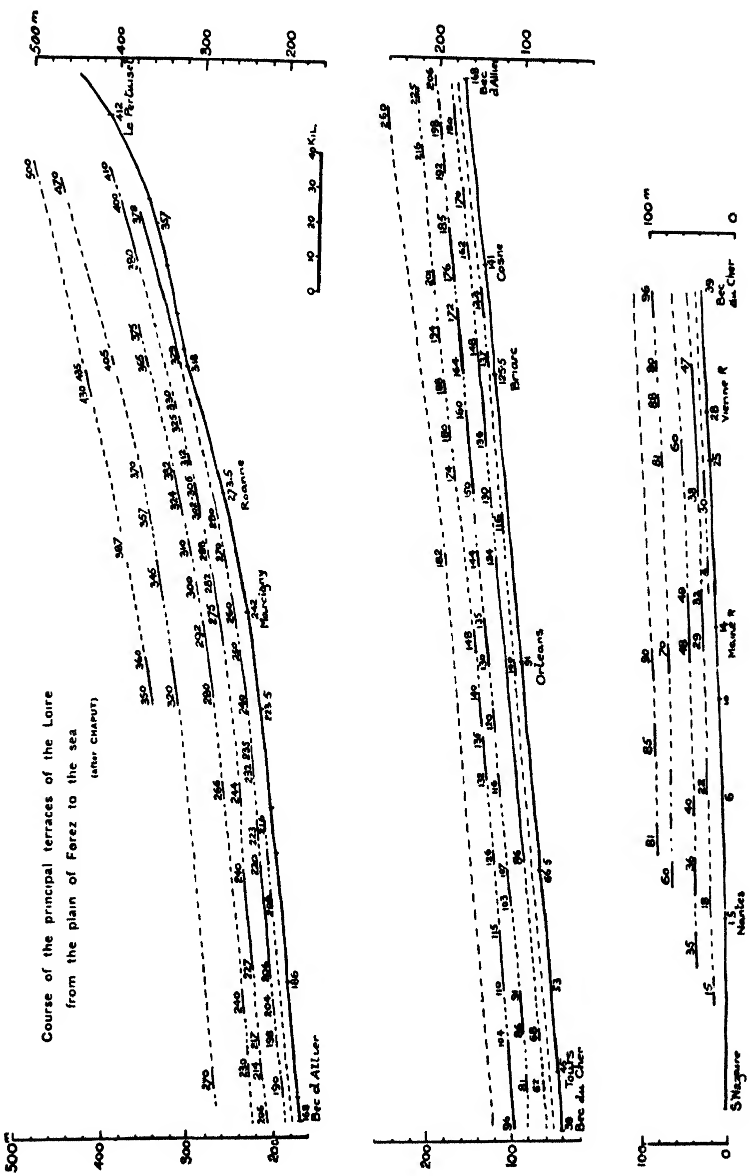

FIG. 14.—The Terraces of the Loire. (After Chaput.)

same time the four ancient coast-lines observed at the mouth of the Rhône and the Isser have been traced around the greater part of the Mediterranean and along the western shores of the North Atlantic Ocean.

We are therefore justified in asserting as a general truth that the four great river terraces are associated with corresponding coast-lines which maintain the same level as the seaward termination of the terraces themselves.

This is a fact of first-rate importance, for it is the position of the mouth of a river which determines the development of its terraces: hence the four terraces owe their position not, as has been supposed, to the ancient glaciers, but to the height of the sea-level at the time they were in process of formation.

A river cannot deepen its bed below the level of the sea, but it cuts its way down from the mouth backwards, *i.e.* up stream, until its slope has acquired a form known as a curve of equilibrium.

This is a slow process, and the fact that the four terraces of many of our river valleys make a close approach to such a curve, and some completely attain it, shows that the relative height of land and sea must have remained stationary for long periods. The existence of the ancient sea-beaches attests the same fact.

The intervals between the terraces and between the beaches point, on the other hand, to comparatively rapid movements.

The periods of repose, during the unchanging level of the sea, afford opportunity for the accumulation, both in the sea and on the land, of sedimentary deposits which closely studied may throw some light on the history of their time.

Let us then examine these deposits, beginning with

those which were laid down in the sea. For this purpose we will proceed to Sicily and land in the Gulf of Palermo.[1] At the head of the Gulf lies a plain gently sloping towards the sea, covered with a rich growth of fruit-bearing trees, oranges, lemons and olives, and well named the "Conca d'Oro." Surrounding it on the landward side are bare rocky hills, and as we look towards these we discern a straight and level line, ruled along them as it were, at a height not far short of 100 m. above the sea. Ascending to it we find that it marks the foot of steep cliffs, undercut, as sea-cliffs often are, and tunnelled into by wide caves; gently sloping outwards and downwards from the foot is the worn, rocky platform on which we stand; it is bare in places, except for incrusting barnacles and limpets, but covered in others by beds of beach pebbles, now cemented into a hard rock. Here are the evident signs of an old coast-line which defined the margin of an inner bay at the head of the Gulf, when its waters stood nearly 100 m. above their present level.

If now we descend the hillside we shall encounter deposits which were laid down in the deeper water of the bay; the pebbly beach soon gives place to sand, and the sand in turn to fine mud or clay. It is of this fine mud that the Conca d'Oro is built up. The waters of the bay were not always muddy, there were intervals when they were clear, and then abundant animal life flourished on the sea-floor. Some rich remains of this, mostly sea-shells, are preserved buried up in the mud which overwhelmed them. These fossils are of species which now inhabit water of about 80 metres in depth. Thus the deposits of the plain and the coast-line of

[1] M. Gignoux, "Les formations marines pliocènes et quaternaires de l'Italie du sud et de la Sicilie," *Ann. l'Univ. Lyon*, n.s., vol. i, Paris, 1911.

the hills afford concurrent testimony to a change of sea-level.

The fossils resemble for the greater part species now living in the Mediterranean, but some of them are identical with those which now inhabit only the colder waters of the North Atlantic, whence they were introduced into the Mediterranean by cold currents flowing along the bottom.[1] Their advent is prophetic of the approaching climate of the first Glacial Age.

In the Conca d'Oro the deposits associated with the 100 m. shore-line find their fullest development, and Prof. Depéret, who has divided the Pleistocene system into four stages corresponding with the four ancient shore-lines, has selected it as the best example of the oldest stage which is known as the *Sicilian.*

The coast-line of from 55 to 60 m. marks the next stage or *Milazzian*. Its beaches contain species of molluscs which indicate a temperate climate, slightly warmer than that of the existing Mediterranean.

The coast-line of from 28 to 30 m. includes amongst its associated deposits beds rich in a handsome shell known as *Strombus bubonius*. The fauna is characterised by "warm" species such as still live off the coast of Senegal and the Canary Islands. This stage is the *Tyrrhenian*.

The last stage, or *Monastirian*, with the coast-line at 18 to 20 m., is named from the city of Monastir in Tunisia, adjacent to a locality very rich in fossils which are almost identical with those of the Tyrrhenian:

[1] Evidently the only immediate inference we can draw from this is that the temperature was low at the bottom of the sea. At the surface or on dry land the climate may have been genial, and that it actually was so is suggested by the asserted discovery in a Sicilian beach deposit of an entire skeleton of an ancient elephant (*Elephas antiquus*), which belongs to an eminently "warm" fauna.

the characteristically "warm" species, however, are confined to the southern coast of the Mediterranean and are not found on its northern coast.[1]

Thus it appears that all the marine stages of the Pleistocene, with the doubtful exception of the Sicilian, testify to the existence of a genial climate, warmer even than that which prevails at the present day.

The three river terraces which correspond with the lower three shore-lines afford similar evidence, the gravels which form their lowest deposits contain the remains of land animals, elephants and rhinoceroses which are suggestive of a warm climate and associated with these the hippopotamus, which is a sure proof of it. The fresh-water shells which are found in some of these gravels, include a species, *Corbicula fluminalis*, which now inhabits the waters of the Nile.

Thus, so far as our inquiry has proceeded, we have discovered no signs of an Ice Age. But it has already been shown that the terraces are closely connected at their source with the great glacial moraines; the Sicilian with the moraine of the first glaciation, the Milazzian with the second, the Tyrrhenian with the third and the Monastirian with the fourth.

Here then we are faced with an apparent contradiction; traced towards the sea the terrace speaks in no uncertain terms of a warm climate, with the hippopotamus disporting itself in the rivers of England and Northern France: traced towards the mountains it tells of a time when Europe was enduring the rigours of a Glacial Age.

How are these conflicting statements to be reconciled?

[1] For a full account of these stages and their distribution in Europe and elsewhere see C. Depéret, "Essai de co-ordination chronologique des temps quaternaires," *Comptes rendus*, clxvi, 1918, pp. 480, 636, 834; clxvii, 1918, pp. 418, 979; clxviii, 1919, p. 868; clxx, 1920, pp. 159, 212; clxxiv, 1922, pp. 1502, 1594.

I think we must assume that the terrace in its higher reaches is a composite structure.

Let us suppose that the river terrace had already been formed during the existence of a genial climate, before cold conditions set in and the glacier, emerging from its mountain fastness, descended the valley. If the glacier overflowed the terrace, as we may fairly conclude it did, it would either destroy the terrace or cover it with boulder clay, and where the glacier came to an end it would dump down upon the terrace its terminal moraine. Finally, the water escaping from the melting glacier would wash out great quantities of sand and gravel and spread them in sheets over the terrace in front of it.

If this be so, the terrace cannot, as a whole, be contemporary with its associated moraine, it is the older of the two.

Strong support is afforded to this explanation by a different kind of evidence. The löss (see p. 144) is a remarkable deposit formed by the winds which blew outwards from the great European ice-sheet. It forms a border to the great moraine (Fig. 6), and by its distribution, composition and included fossils, which belong to the cold fauna, is shown to be of glacial origin.

Löss of two distinctly different ages has so far been recognised, an older löss contemporaneous with the third glaciation, and a younger löss with the fourth.

The older löss is found lying on the gravels of the Tyrrhenian terrace, the younger löss on those of the Monastirian terrace; it also overlies the older löss. Hence the Tyrrhenian terrace is older than the third glaciation, and the Monastirian terrace older than the fourth. In this we find confirmation of our conclusion that the terrace gravels are for the greater part not glacial but interglacial in age.

Our study of the ancient shore-lines informed us of the rise of the sea-level or subsidence of the land which affected the European continent in Pleistocene times; we have now to add that each subsidence was followed by an elevation of the land. Thus at some time, during the latter part of the Sicilian age, the land began to recover from its depression and steadily rose above the sea; it reached the Milazzian level but did not stop there; on the contrary, it continued to rise for an unknown distance until it stood, in all probability, as much higher above the existing sea-level as it had previously been depressed below it.

A similar oscillation occurred in each of the succeeding ages. (Fig. 15.)

It was during the periods of elevation that our islands were connected with the Continent, and the Pleistocene fauna, with its great elephants, rhinoceroses and hippopotamuses, passed dry-footed over what is now the English Channel.

Before leaving this subject it should be pointed out that the great mass of Scandinavia was subject to upward and downward movements on a much grander scale than the rest of Europe. At one time it was elevated some hundreds of metres above its present level, and at the close of the last Glacial episode, when the ice for the greater part had melted away, it was submerged to a depth of at least 400 metres.[1]

We are now in a position to define with greater

[1] The number and ingenuity of the attempts made to explain the occurrence of Glacial episodes are truly astonishing; for an instructive summary see Th. Arldt, *Zeit. f. Gletscherkunde*, vol. xi, 1918–20. They include an appeal to changes in the relative level of land and sea, and recently a fall in the sea-level has been invoked by F. Enquist, "Eine Theorie über die Ursache der Eiszeit und die geographischen Konsequenzen derselben," *Bull. Geol. Inst. Upsala*, vol. 13, p. 35, 1915; and by C. E. P. Brooks, *The Evolution of Climate*, London, 1922.

precision the Sicilian and other Pleistocene stages. The curve which represents the changing level of the sea during the Pleistocene epoch (Fig. 15) will be seen to include four complete oscillations, each consisting of a trough and crest. Each oscillation represents a stage, and each stage is divided into a lower[1] or older part (the crest) and a higher or younger part (the trough). Thus when speaking of the deposits of a stage, the Sicilian, for example, we may distinguish between a lower and an upper Sicilian. The lower divisions correspond with genial episodes; glacial episodes are

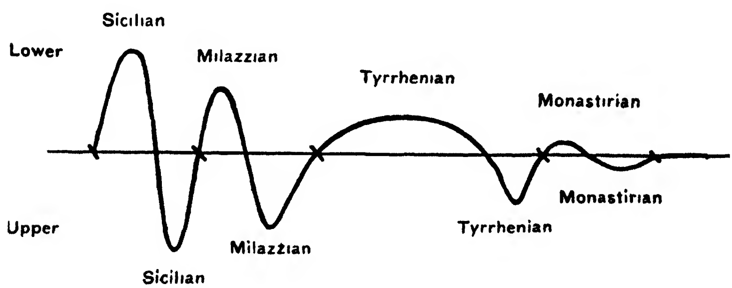

FIG. 15.

supposed to be restricted to some part of the upper divisions.

It will be seen from this brief sketch how greatly during the last few years the united labours of many geologists, foremost among them Prof. Depéret, have advanced our knowledge of the period, popularly known as the Great Ice Age. The significance of the four river terraces has been deepened and new avenues of investigations are opened up which it will be the delightful task of future geologists to explore.

It now only remains to introduce the Great Ice Age,

[1] Lower is used here as equivalent to older and refers to the position of the period as represented in a vertical column (see Fig. 16).

or rather the Pleistocene epoch of which it forms a part, into the general scheme of geological chronology.

The history of the earth, since the birth of the Ocean, is recorded more or less continuously in the sedimentary strata which were deposited on the sea-floor and now

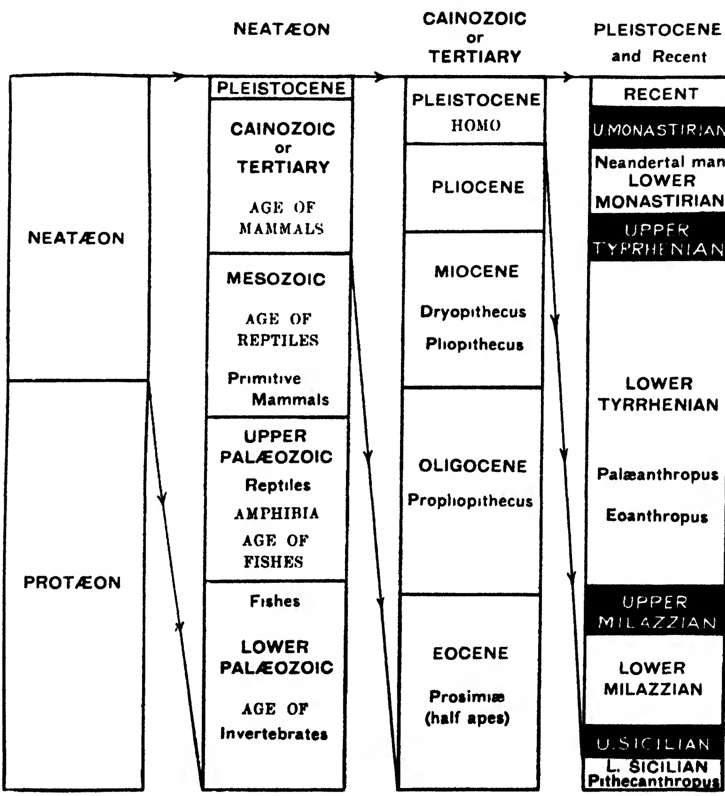

FIG. 16.—A Scale of Time based on the succession of the stratified rocks.

contribute to form the outer crust of the globe. It covers, according to one school of geologists, a period of 100 millions of years, or, according to another, of no less than 1600 millions,[1] and may be divided into two epochs

[1] Joseph Barrell, "Rhythms and the Measurement of Geologic Time," *Bull. Geol. Soc. America*, vol. 28, pp. 745–904, 1917.

of approximately equal length, which have been named the Protæon and the Neatæon[1] (Fig. 16).

The sediments of the Protæon are almost entirely devoid of fossils, though not of abundant signs of life. Ancestral forms of invertebrate animals no doubt swarmed in its seas, but are now only represented by limestone and carbonaceous deposits. Consequently the first half of the story of life on our planet is lost beyond recall. The record opens in the middle with the beginning of the Neatæon, when most of the great groups of Invertebrata were already in existence, and from that time on we can trace the evolution of the animal kingdom in orderly progress from the first appearance of fishes, through amphibia, reptiles and mammals up to its final culmination in man.

The Neatæon is expanded in the second column of the table to show the four eras into which it is divided. The Tertiary or Cainozoic era, being the only one of immediate interest to our inquiry, is then expanded in the third column into its successive epochs, and of these the Pleistocene is expanded in the last column. The relative duration of each period is indicated by the length of the column allotted to it.

The recent and Pleistocene epochs are supposed on the "short time" estimates to have lasted 300,000 or 400,000 years, on the "long time" estimate to one and a half millions.

In the Eocene epoch we discern the beginnings of the great groups or orders of existing mammals; in the Oligocene many existing families begin to appear, but no existing genera; in the Miocene existing families become more numerous and a few existing genera occur; in the Pliocene existing genera are plentiful, but no

[1] πρῶτος, *protos*, first; αἰών, *aion*, age; νέατος, *neatos*, latest.

existing species of mammals are known, and finally in the Pleistocene existing and extinct species become equally numerous.

In the fourth column Glacial episodes are distinguished by white letters on a black ground. Man—*Homo sapiens*—is not met with till the beginning of the upper Monastirian age; but his ancestry extends as far back as the beginning of life in the Protæon. Many millions of years were needed for his gestation in the womb of Time.

CHAPTER II

THE ANTIQUITY OF MAN

THE dawn of the human race is supposed to belong to a past more remote than the beginning of the Great Ice Age; yet of the existence of man antecedent to that epoch not a vestige of evidence has so far been discovered. Distinguished anthropologists have even insisted that this is only what we might reasonably expect, since out of the whole world of existing mammals not a single existing species has yet been found among the fossilised faunas prior to that epoch. Man is hardly likely to have proved a strange exception to the rule.

Here, however, a singular confusion has arisen from the indefinite use of the word "man." We have just used it in its accepted sense, the meaning attributed to it ever since man's speech began to be recorded in literature. It includes all the existing varieties of our kind —all the nations of the earth are of one blood—and the zoologist to express this fact assigns man to the single genus *Homo* with the single species *sapiens*.

Similarly he refers all the varieties of man's familiar companion, the dog, to the genus *Canis*, species *familiaris*. The living representatives of the genus, however, include more than one species, *Canis vulpes* for one; but when we speak of this in the English tongue we do not call it a dog or even a fox dog, but just simply a fox.

Now we shall find as we pursue our investigation that at a period comparatively recent we lose sight of *Homo*

apiens. He disappears as we approach the beginning f the upper Monastirian age, and we encounter in his lace another and very different species, *Homo Neander-lensis.* Thus precisely considered the argument in uestion is fully justified; indeed the limit of man's ge is even more restricted than had been supposed. ŀut how are we to render the name of this older and xtinct species in English? It would seem we have no lternative. We must say "Neandertal man." Having ius extended the meaning of the word we may now ssert truly that man extends backwards in time as far s the middle of the Monastirian age.

We now go back a little farther still, and then even this ɔecies disappears and we discover other forms so remote 'om *Homo sapiens* that they can no longer be referred) the same genus, and new genera must be instituted to ɛceive them, such as Eoanthropus and Palæanthropus[1] f Tyrrhenian age. It would seem a strange misuse f terms to speak of these as "man." The zoologist ıeets the difficulty by including the various man-like ɜnera in a group of higher order—the family, which is ımed Hominidæ, so that if we wish to be precise, and recision is of great importance in these matters, we ıall not speak of these human predecessors as men, but ominids.

Finally, when we arrive in our backward journey at ıe Sicilian we encounter that strange creature, ithecanthropus, which is so ambiguous that dis-nguished naturalists are not agreed whether it should ȝ placed among the Hominids or the anthropoid apes. ɔ the consideration of this form we may now turn.

Pithecanthropus erectus.—On the south flank of the endengs, a range of low hills which traverse the

[1] Some anatomists refer *Homo Heidelbergensis* to this genus.

eastern extremity of Java (Fig. 17), lies a gently undulating series of fresh-water and volcanic deposits formed of consolidated clay, sand, and volcanic lapilli, altogether considerably over 1000 feet in thickness. They rest on a bed of coral limestone which is about 7 ft. thick, and of Tertiary age; below it is a bed of clay

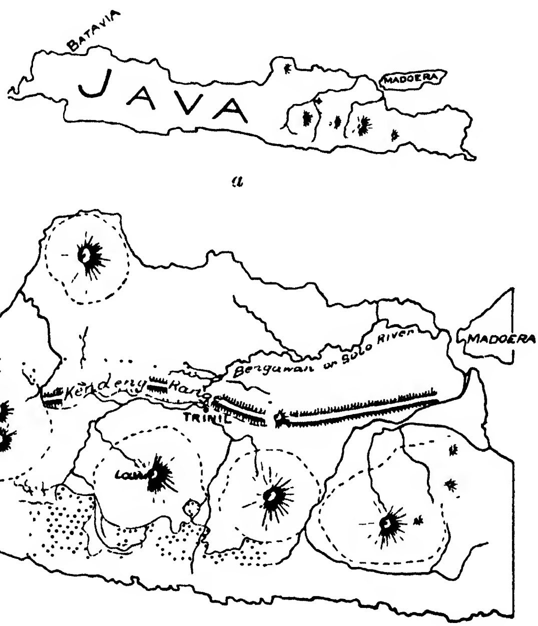

FIG. 17.—*a*, Outline of Java; the position of Trinil is indicated by a cross. *b*, The region around Trinil shown on a larger scale. The dotted area represents Tertiary deposits.

containing marine shells, all of which are preserved with their valves closed, a sign of sudden death, resulting possibly from a volcanic eruption. Such an eruption might have heralded the birth of Lavu-Kukusan, a great twin volcano, more than 10,000 feet in height, and not yet completely extinct, which rises, south of the Kendengs, out of the gently undulating fresh-water series.

The river Bengawan, which flows round a great part of the volcano, has cut its way down into the fresh-water deposits to a depth of 50 ft., exposing a fine section just at the point where the river touches the Kendeng hills, near the village of Trinil (Fig. 17). A bed of lapilli at the base is especially rich in Mammalian remains. Vast quantities of bones have been exhumed, affording us a vivid picture of the life of the time.[1] Various kinds of deer are richly represented, and a new species, *Cervus lyrioceros*. There is also an antelope, *Tetraceros kroesenii*, allied to an existing Indian form. Next come

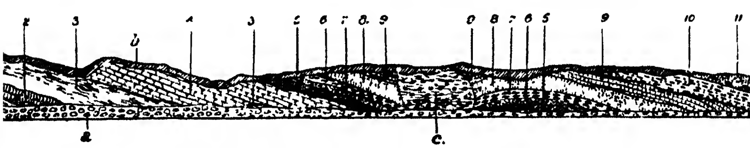

FIG. 18.—1, Argillaceous marl (marine); 2, coral limestone; 3, argillaceous marl and sandstone; 4, conglomerate; 5, clay; 6, chief bone-bearing bed; 7, tuff and conglomerate, 8, tuff; 9, tuff of lighter colour tint than 8; 10, white tuff; 11, tuff and conglomerate. *a*, River bed; *b*, bluish-black clay; *c*, confused mass of beds. The remains of Pithecanthropus were found in the bone-bearing layer (6), where it begins to disappear below bed 7 on the right of the little anticline. (After Branca.)

buffaloes, rhinoceros, a tapir, similar to a living Sumatran form, pigs, hippopotamus, a new species of the extinct Stegodon, and an elephant, allied to *Elephas hysudricus* or *E. antiquus*.

Among the Carnivora, the most interesting species is *Felis groeneveldtii*, said to combine in itself the characters of the lion and the tiger.

There were monkeys, such as Semnopithecus and Macacus.

[1] Eugène Dubois, "Einige van Nederlandschen Kant verkregen uitkomsten met betrekking tot de kennis der Kendeng-Fauna (Fauna van Trinil)," *Tijdschrift v. h. K. Nederl. Aardrijk. Genoot*, 1907, ser. 2, xxiv, p. 449.

The Edentata were represented by a large Pangolin, which attained a length of 8 ft.

In addition to the Mammalia, some birds have been found, such as parrots and marabouts; reptiles also, crocodiles, gavials, and fresh-water tortoises; a number of fresh-water fish, all belonging to existing species; and a shark, *Carcharias gangeticus*, which points to the proximity of the sea.

Amidst these remains, Dr. Eugène Dubois, who had left Holland for Java with the avowed intention of finding the "missing link," discovered in September 1891 an upper molar tooth, the wisdom tooth of the upper jaw of *Pithecanthropus erectus*; a month later, between three and four feet away from the tooth, the cranial vault or skull-cap (Fig. 19) was found lying in the same bed, and on the same horizon. Work was then suspended on account of the rainy season, but was resumed in May of the following year, and in August the thigh-bone of the left leg was found lying 50 ft. away from the spot where the first tooth was obtained, but still on the same horizon, and finally, in October, another tooth[1]—the second upper molar of the left side—was found 10 ft. away from the skull-cap.

After raising a monument to the memory of this supposed ancestral man,[2] Dr. Dubois returned to Europe, bringing his spoils with him.

[1] In an interesting letter Dr. W. Booth Pearsall, who has made a close study of these teeth, informs me that this also he regards as a wisdom tooth (m_3). He adds that the cusps have been worn away by attrition, and that the wisdom teeth of baboons and other apes are sometimes similarly worn down. Dubois, however, in a letter to W. K. Gregory, adheres to his original determination, which is that given in the text, and supports it by the observation that a distinct scar is to be seen on the posterior border of the tooth such as would be produced by the presence of a tooth behind it.

[2] It stands on the edge of a cliff, overlooking the last resting-spot of Pithecanthropus (previous to his removal), and has served as a useful guide to subsequent investigators.

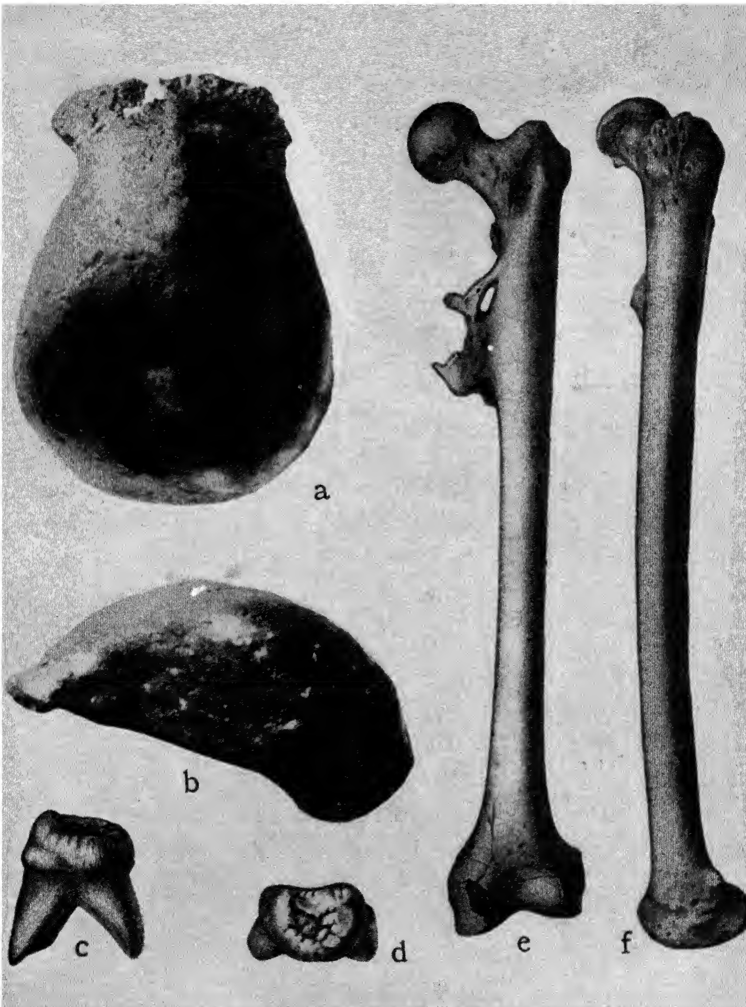

FIG. 19.—*Pithecanthropus erectus*, Dubois. *a*, The skull-cap seen from above; *b*, in profile; *c*, *d*, the first found molar tooth, seen from the side and from above; *e*, *f*, the femur, seen from in front and in profile. (After Dubois, *a* and *b* × ⅓; *c* and *d* nat. size; *e* and *f* × ¼ about.)

The Dutch Government continued the excavations at Trinil after Dr. Dubois' departure, but beyond an additional grinding tooth (*pm.*), not yet described, nothing of importance was found. The district has, however, been visited since by several investigators. The most important of recent expeditions, conducted by Madame Selenka (Fig. 20), made extensive excavations on both sides of the river at Trinil in 1907 and 1908:

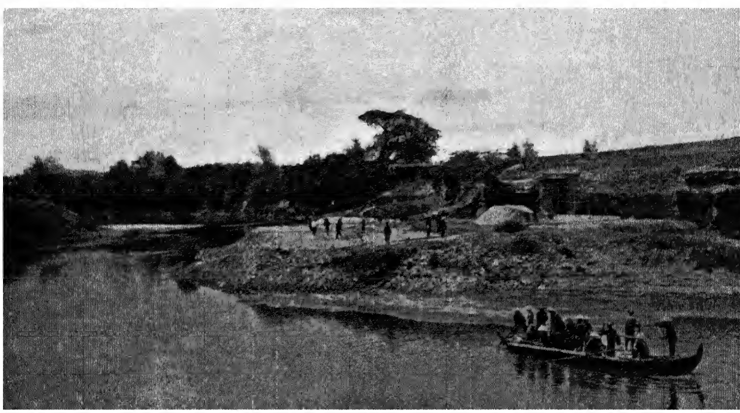

FIG. 20.—The locality where the remains of Pithecanthropus were found, on the banks of the river Solo. A white cross, visible under a low magnification, marks the place more precisely. After a photograph by Mme. Selenka.

altogether some 10,000 c.m. of rock were removed, exposing 610 sq. m. of the Pithecanthropus bone bed, each square metre of which yielded on an average three bones to the explorers; but no additional remains of Pithecanthropus were discovered.[1]

A complete description of the remains of Pithecanthropus has been published by Dr. Dubois,[2] and

[1] L. Selenka and Max Blanckenhorn, *op. cit.*

[2] E. Dubois, "*Pithecanthropus erectus*, eine menschenähnliche Uebergangsform aus Java," Batavia, 1894, 4to, p. 44; and "*Pithecanthropus*

they have been studied by almost all the leading anatomists in Europe. All are agreed that they indicate an animal bearing a close resemblance to men and apes, but beyond this opinions are no longer in harmony; some regard Pithecanthropus as an ape with certain human characters, others as a man with evident simian characters; others again, and in particular Dr. Dubois himself, regard it as a connecting-link, standing mid-

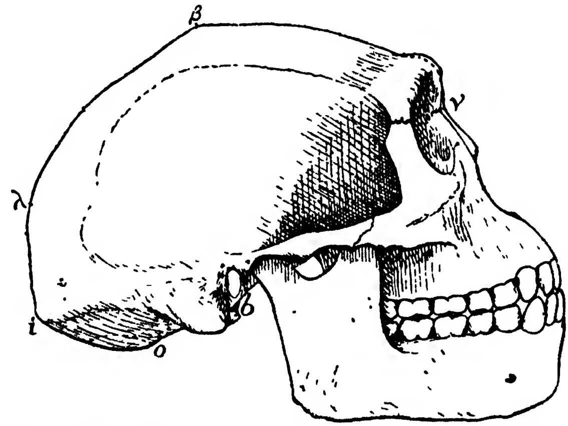

FIG. 21.—The skull of Pithecanthropus as restored by Prof. Manouvrier.

way between man and the higher apes. The suggestion has even been made that the remains are those of a microcephalic idiot, or again of a monster begotten of human and simian parents.

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erectus, transitional form between Man and the Apes," *Sci. Trans. R. Dublin Soc.*, 1898, vi. pp. 1–18. See also L. Manouvrier, "Discussion du *Pithecanthropus erectus* comme précurseur présumé de l'Homme," *Bull. Soc. d'Anthr. de Paris*, sér. 4, tome vi, 1895, p. 12; "Deuxième étude sur le Pithecanthropus," *ibid.*, tome vii, 1896, pp. 396–460; "Réponse aux objections contre le Pithecanthropus," *ibid.*; M. Houzé, "Le *Pithecanthropus erectus*"; Dubois, *Bull. Soc. d'Anthr. de Bruxelles*, tome xiv and xv, 1896; G. Schwalbe, "Studien über *Pithecanthropus erectus*," *Zeits. f. Morph. u. Anthrop.*, 1899, i, pp. 16–240, and M. Schlosser, "Die neueste Literatur über die ausgestorbenen Anthropomorphen," *Zool. Anzeiger*, 1900, xxiii, p. 289. An account of the literature is given by H. Klaatsch, *Zool. Centralblatt*, 1899, vi, p. 217.

Disregarding those opinions, which have little of probability to recommend them, let us review the question in broad outline.

That which distinguishes man from all the beasts of the field is the power and complexity of his mind, and whether the brain be a dream of the mind or the mind a dream of the brain, the two are certainly associated in a manner as close as it is inexplicable. Thus the chief interest in the Trinil fossil attaches to the skull-cap or brain-pan (Fig. 19). In its general form and most important characters this is certainly more simian than human; recalling indeed, by many of its features, the most primitive of the man-like apes, *i.e.* the gibbon.

It is wall-sided and flat-roofed: 185 mm. in length and 130 mm. in breadth, and therefore dolichocephalic or long-headed, with an index[1] of 70; its height is 65 mm., and the ratio of this to the length is 35; it is therefore very platycephalic, or flat-headed.

The forehead, which is low and receding, even more so than in the chimpanzee or even the gibbon, ends in front in a ridge (frontal torus) which overhangs the place once occupied by the face. The middle of the forehead rises in a longitudinal ridge[2] which extends backwards to a little beyond the top of the head, expanding just before its termination into a rounded prominence which is situated just over the spot once occupied by the fontanelle. Immediately behind this,

[1] The index is a number expressing the ratio of the length to the breadth, thus $\frac{\text{Breadth} \times 100}{\text{Length}} = \text{Index}$. When the index is 75 or less the skull is dolichocephalic, when 80 or more it is brachycephalic (short-headed); when between 75 and 80, mesaticephalic.

[2] According to Prof. Manouvrier this ridge is due to excessive ossification, which in modern examples is united with unusual thickness of the skull, precocious obliteration of the frontal suture and precocious ossification of the fontanelle.

on each side of the middle line, is a faintly marked oval depression which corresponds, as my friend Prof. G. Elliot Smith assures me, with a depressed area of the brain, clearly visible on a plaster cast of the interior of the skull.

One of the first requirements in making a comparative study of skulls is the presence of definite points of reference, and some of the more important of these are provided by certain anatomical features with which we may now make ourselves acquainted.

Proceeding in order from before backwards we have (1) the *nasion* (ν), a point which lies at the root of the

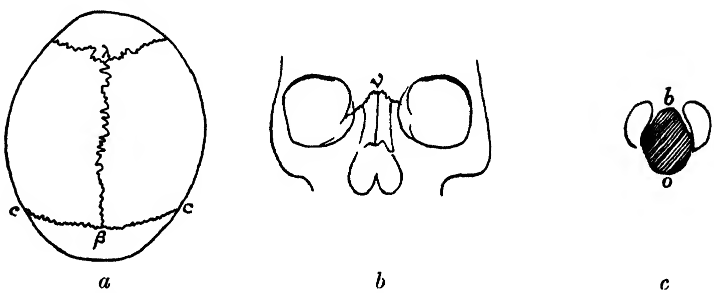


FIG. 22.—Some anatomical points on the skull. The letters by which these points are indicated in this figure will be used throughout the book.

nose, precisely where the suture between the nasal bones meets the suture by which these bones are united to the frontal or forehead bone (Fig. 22 *b*); (2) the *bregma* (β), which lies at the top of the skull where the sagittal suture ($\beta\lambda$) between the parietal bones meets the coronal suture ($c\beta c$) between the parietal and frontal bones (Fig. 22 *a*); (3) the *lambda* (λ), at the back of the skull where the sagittal meets the lambdoid suture which unites the occipital and parietal bones (Fig. 22 *a*); and finally, at the base of the skull, (4) the *basion*, (*b*) which corresponds with the anterior end of the major axis of the occipital foramen, and (5) the *opisthion* (*o*) 22 *c*, which corresponds with the posterior end of this axis.

There is a definite relation between some of these points and the regions of the brain, which renders them useful guides to operations in cerebral surgery; thus the nasion is not far off[1] the front end of the brain, the bregma lies 4 or 5 centimetres in front of the fissure of Rolando which divides the frontal from the parietal lobes of the brain, and the lambda lies near the fissure which divides the parietal from the occipital lobes, usually a little behind it.

It is interesting to observe that similar relations obtain in some of the higher apes; in the chimpanzee[2] the relative positions of the bregma and lambda with the corresponding fissures of the brain are almost precisely the same as in modern man.

Let us now return to Pithecanthropus. A sagittal, *i.e.* median longitudinal, section of the skull is represented by the thick line in Fig. 23. At each extremity this is continued by a broken line, supplied from Prof. Manouvrier's restoration (Fig. 21), to represent the parts which are missing in the original.

For comparison similar sections of the skull of a chimpanzee (cranial capacity 430 c.c.) and a gibbon (cranial capacity 104 c.c.) are placed within this section, and outside it the Neandertal skull (cranial capacity 1626 c.c.) and the skull of a Swede.

All the sections are superposed on a common centre, which is the morphological centre of each, and on a common axis which is drawn through the centre and bisects the angle subtended at the centre by the major

[1] This is truer of man than the anthropoid apes. In the latter the nasion lies a considerable distance above the front end of the brain.

[2] D. J. Cunningham, "Contributions to the Surface Anatomy of the Cerebral Hemispheres," *Cunningham Memoirs*, No. 7, 1892, p. 185, *Roy. Irish Acad.*, 1892.

axis of the occipital foramen[1] A second axis is drawn through the centre at right angles to the first, and thus the section is divided into four quadrants of 90°.

It will now be seen at a glance that the nasion of the Swede makes an angle of more than 270° with the semi-

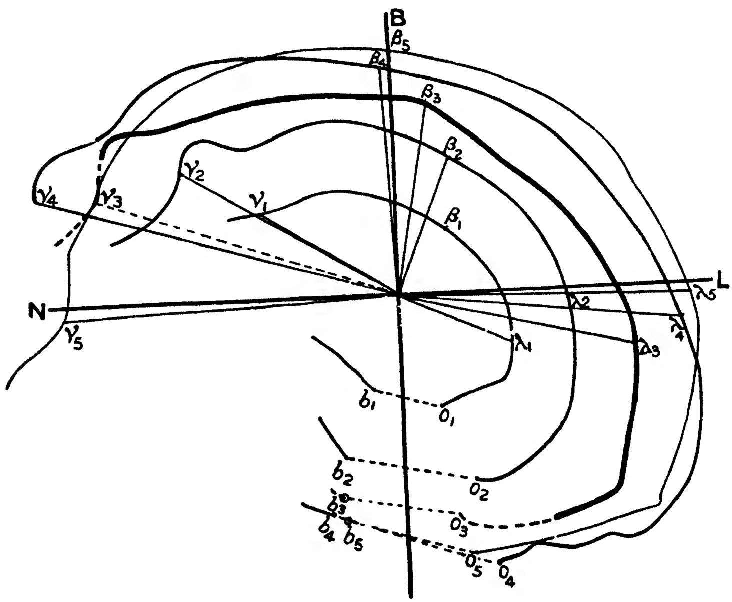


FIG. 23.—Sagittal sections of the skull of a gibbon,[1] chimpanzee,[2] Pithecanthropus[3] (thick line), Neandertal skull[4] (La Chapelle aux Saints), and a Swede[5] superposed on the centre of figure and the foraminal axis (B). *b*, basion; *o*, opisthion; λ, lambda; β, bregma; ν, nasion. The figures attached to these points indicate the several skulls.

axis drawn through the occipital foramen; the excess is, in fact, 2°. In the existing species of man the nasion angle may fall short of 270°, seldom, however, more than one or two degrees; only in one instance known to me, and that of an Australian skull, primitive in all its

[1] "A Method for the Comparative Study of the Human Skull," *Proc. Roy. Soc.*, Ser. B., vol. 94, p. 134, 1922.

characters, does the deficiency amount to more than 5° or 6°.

But it is obvious by inspection that the nasion of Pithecanthropus falls short of 270° by a much greater angle than this, by no less indeed than 19°, and in this particular [1] it resembles the Neandertal skull, in which the deficiency amounts to 17°.

In the chimpanzee and the gibbon the nasion angles are almost identical, differing only by one degree; the deficiency in the chimpanzee being 31°.

Thus judged by this character alone, Pithecanthropus stands almost midway between modern man and the higher apes.

In the interpretation of the features of Pithecanthropus there has been much difference of opinion, and the position of the bregma has given rise to a veritable comedy of errors. It was plainly seen by Prof. Dubois, and later by Prof. Manouvrier, in the place assigned to it in the diagram (Fig. 21). Schwalbe, however, in complete disregard of their statements shifted it on theoretical grounds to a point 20 mm. further back and left it there, notwithstanding a strong protest from Dubois. The position of the bregma is a matter of importance, but it has been used by Schwalbe in an illegitimate way to determine what he has named the bregma angle. This angle, however, is the resultant of a number of independent variables, chief among them a line drawn from the glabella to the external inion, the latter being a variable point dependent in position on muscular attachments.

Dr. Martin Ramström [2] next made use of the bregma

[1] The magnitude of the angle is, however, obtained from Prof. Manouvrier's restoration and may be slightly less or more than 19°.

[2] M. Ramström, *Festskrift tillagenad Prof. J. A. Hamman*, Upsala, Contribution xxix, 1921.

angle—based upon the false position assigned to the bregma by Schwalbe—in an endeavour to prove that the skull of Pithecanthropus is that of a gigantic chimpanzee and without any organic relation to the thigh-bone, which he attributes to a man.

Finally, Dr. R. Mair,[1] after admitting that Schwalbe was mistaken, has asserted that Dubois and Manouvrier could not have seen the bregma in the place they

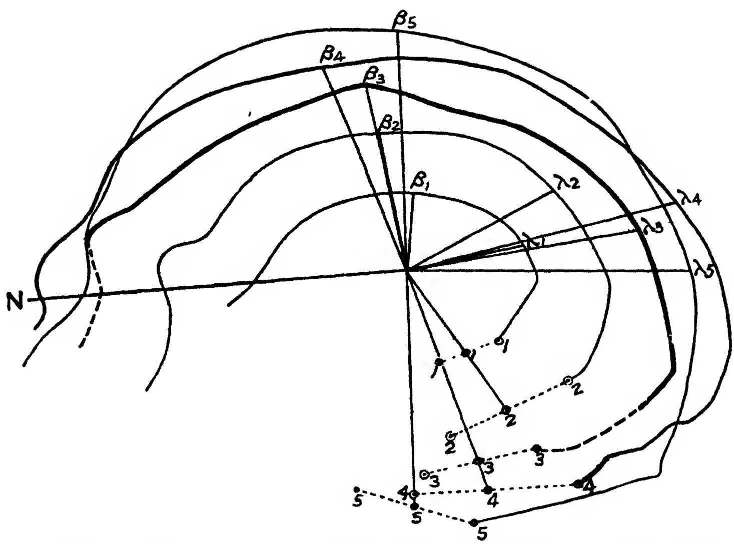


FIG. 24.—The same sections as in Fig. 23, but rotated to bring the nasion radii into coincidence.

assigned to it,[2] and so shifted it 8 or 9 mm. in front of its true position. He then found, to his great delight, that it gave a bregma index corresponding precisely with that of the Neandertal skull, known as Spy I.

My friend Prof. Dubois, with whom I have been in

[1] R. Mair, "Ueber die Bregmagegend . . . des Pithecanthropus," *Zeits. f. Morphologie und Anthropologie*, Bd. xxii, p. 435, 1922.

[2] Dr. Mair asserts that Prof. Dubois had admitted to Prof. Schwalbe that his observation was in error. Prof. Dubois informs me that there is no ground for this statement.

communication, now informs me that he has completely cleaned out the interior of the skull-cap, and that the bregma, obviously visible there, as previously on the outside, is situated precisely at the point where he first observed it.

For the better comparison of the frontal region of the skull Fig. 24 is introduced. It represents the same sections as appear in Fig. 23, but rotated on their common centre so as to bring the nasion radii into coincidence.

A remarkable difference may now be observed between the gibbon and Pithecanthropus, for while the bregma of the latter falls several degrees in front of the vertical axis, that of the gibbon, like that of the Swede, approximately coincides with it.

A further comparison may be made between the angular magnitude of the frontal, parietal and occipital arcs of the different skulls under consideration. These arcs are, of course, defined by the different anatomical points; from the nasion to the bregma is the frontal arc, from the bregma to the lambda the parietal, and from the lambda to the foraminal axis the occipital arc.

Their values in degrees are set forth in the following table:

	Frontal.	Parietal.	Occipital.
Gibbon	97°	75°	66°
Chimpanzee	81° [1]	75°	83°
Pithecanthropus	81°	93°	77°
Neandertal	71°	100°	83°
Swede	92°	92°	88°

It will be seen that the frontal arc of the gibbon greatly exceeds that of Pithecanthropus in angular magnitude, and even that of the Swede; on the other

[1] This low value for the chimpanzee is correlated with the displacement upwards of the nasion.

hand, the parietal arc is much shorter than that of Pithecanthropus; the occipital arc is also shorter; but Pithecanthropus comes next to it in order of magnitude.

The shortness of the occipital arc in the gibbon is no doubt correlated with the shortness of the occipital lobes of its brain, a feature first observed by Flower and then confirmed by Waldeyer and Cunningham.[1] The occipital lobes of the gibbon are indeed the shortest to be found among the Primates.

Finally, if we compare the magnitudes of the frontal and parietal arcs taken together we have:

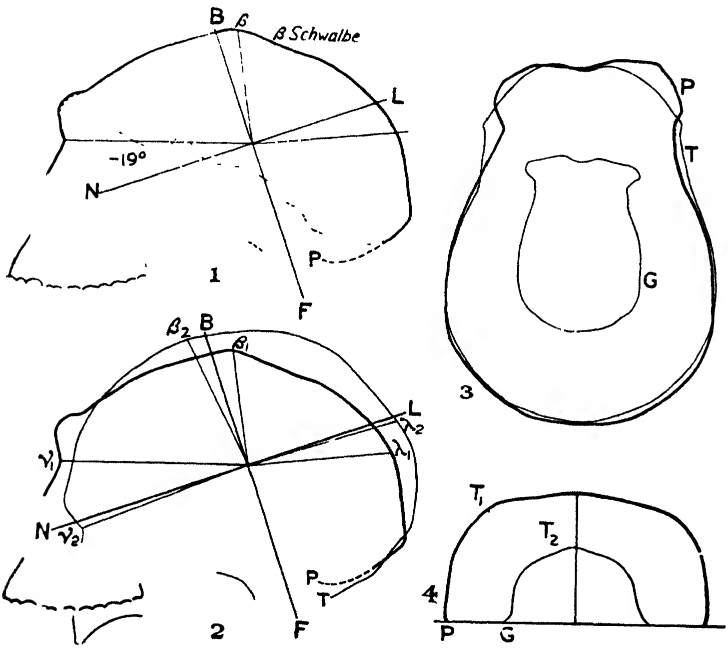
Chimpanzee	156°
Neandertal	171°
Gibbon	172°
Pithecanthropus . . .	174°
Swede	184°

and Pithecanthropus is brought into close relation with the Neandertal skull and the gibbon's.

If we compare the sagittal section of the skull of Pithecanthropus (Fig. 25, 1) with one of the lower races of *Homo sapiens*, such as the Tasmanians, we obtain the result shown in Fig. 25, 2, and it will be seen that the Tasmanian's skull, although smaller than the Swede's, is still distinguished by a large nasion angle, slightly larger indeed than that of the Swede. In height also the Tasmanian skull greatly exceeds that of Pithecanthropus skull. On the other hand, there is a fair agreement between the outlines of horizontal sections taken through the respective skulls, the only marked difference being that due to the great development of the frontal torus in Pithecanthropus (Fig. 25, 3). A similar section of the skull of a gibbon is placed in the middle of this figure, and notwithstanding the marked difference in size,

[1] W. H. Flower, *Nat. Hist. Rev.*, 1863, p. 279.

there is an evident resemblance in general outline. To complete the comparison a vertical section of the gibbon's skull standing on the same base as that of Pithecanthropus is represented in Fig. 25, 4. The superior



EXPLANATION OF FIG. 25

1. Sagittal section through the skull of Pithecanthropus.
2. The same section compared with one through the skull of a Tasmanian.
3. Horizontal sections through the skulls of P, Pithecanthropus; T, a Tasmanian, and G, a gibbon, all superposed on the same centre of figure.
4. Vertical sections, taken through the opening of the auditory meatus, of the skulls of Pithecanthropus, P, and a gibbon, G. T_1 and T_2 the temporal lines of the two skulls.

limit to the attachment of the temporal muscles (T_1 and T_2) extends much farther up the sides in the gibbon's skull.

The matrix with which the skull-cap was filled when

it was first brought over to Europe has since been carefully removed, so as to expose the interior, thus rendering it possible to obtain a plaster cast which represents approximately the form of the brain.

Next to mind, speech is the distinctive faculty of man; some thinkers have even given it the first place. But the faculty of speech has been shown by recent researches to be associated with a definite area of the temporal region of the brain (first temporal lobe). Fortunately this region can be identified on the plaster cast just alluded to; its area has been measured by Dr. Dubois, and is said to be twice as great as in the anthropoid apes, but only half as large as in man.[1] Thus in this one respect Pithecanthropus may be truly regarded as a middle term. If further we are justified in arguing from organ to function, then we may fairly conclude that this primitive precursor of the human race had already acquired the rudiments of vocal speech.[2]

We have left one of the most important characters to the last[3]; this is the size of the skull-cap, or rather its capacity for containing brains. According to the latest measurements of Dr. Dubois the cranial cavity has a volume of 850 cubic centimetres. We must not omit to point out, however, that this can only be taken as an

[1] E. Dubois, "Remarks on the Brain-cast of *Pithecanthropus erectus*." *Journ. Anat. and Phys.*, 1899, xxxiii, pp. 273–6.

[2] As the result of recent study of the cranial cast, Prof. G. Elliot Smith concludes that the features of the brain prove Pithecanthropus to belong to the human family. It represents a specialised and unprogressive branch which became extinct in the Pleistocene period. The temporal region of the brain reveals characters of great interest and indicates that Pithecanthropus was endowed with rudimentary powers of speech.—Report of a Paper read before the Royal Society, *Nature*, February 26th, 1914, p. 729.

[3] In these days of triumphant athleticism this sounds like a startling paradox: even in our Universities the power to kick a football through a goal or to row a boat to victory would almost certainly be considered a criterion of at least equal value.

approximate estimate: the skull is far too incomplete for exact measurement.

The cranial capacity of the higher apes is not known to exceed 600 c.c., and that of a healthy human being never falls, so far as existing observations extend, below 880 c.c.;[1] the mean of these two numbers is 740, and this should be the capacity in cubic centimetres of a form standing midway between the lowest man and the highest ape; but, as we have seen, this limit is already exceeded in Pithecanthropus, even to the extent of 110 c.c., and thus, judged by a character which is generally regarded as of great importance, Pithecanthropus must be included within the limits of the human family. In the long ancestral series which extends upwards from the apes to man he has mounted far more than half-way, and comparatively few steps of the long ascent remain to separate him from the species *Homo sapiens*, essential man.[2]

The facts may be most clearly shown by a diagram (Fig. 26). The curve for the Tyrolese skulls, chosen to represent the highest existing races, is a fairly good one, being based on 557 examples.[3] It is remarkable for the wide range of capacity which it displays, extending from a minimum of 900 c.c. to a maximum of 1900 c.c. The curve for the Australian skulls is

[1] Out of 904 Tyrolese skulls one was found with this minimum capacity. It is asserted to be perfectly normal in other respects.—F. Tappeiner, *Zeits. f. Ethnologie*, 1899, xxxi, p. 304. The minimum found in an Australian woman's skull by Sir W. Turner is 930 c.c., and in a Dravidian Bheel skull 940 c.c. *v. Trans. Roy. Soc. Edin.*, 1911, xlvii, p. 452, footnote.

[2] It is not intended by this to express any opinion on the lineage of *Homo sapiens*; Pithecanthropus, though a precursor, is by no means necessarily an ancestor. He may be only the final product of an independent branch of the Hominid tree. There may be many species which have attained the same stage of evolution without being able to claim common descent.

[3] F. Tappeiner, *loc. cit.*

based on all the published material available; this is comparatively small, though large compared with that relating to the gorilla, which is altogether inadequate.

If Pithecanthropus is an average example of its kind it must have been accompanied by associates of greater and less capacity, and by assuming a range of variation intermediate between that presented by the Australian native women and the gorilla, we obtain the curve given

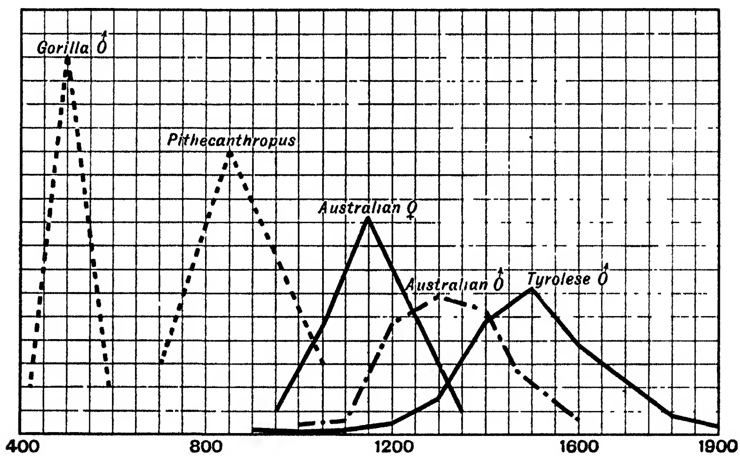


FIG. 26.

in the diagram. It overlaps the curves for all the human skulls, but is separated from that for the gorilla by a considerable hiatus (100 c.c.).

We have now passed in brief review the chief features of the skull-cap: as to the molar teeth, they are distinguished by their great size, only rarely attained by modern man, and by their widely divergent roots. Prof. Gregory,[1] our most distinguished authority on mammalian dentition, remarks that the third upper

[1] W. K. Gregory, "The Origin and Evolution of Human Dentition," *Journ. Dental Research*, vol. ii, p. 688, 1920.

molar looks as if it might have been derived from the corresponding molar of a form resembling Dryopithecus (a possible simian ancestor of man), while the second molar is remarkable for the great reduction in size of its posterior moiety, a degenerate character only acquired late in the course of human evolution; its precocious appearance here is supposed to exclude Pithecanthropus from the direct line of human descent. Prof. Gregory concludes with the remark that the teeth are subhuman and differ in detail from all others known to him.

Especial interest attaches to the femur or thigh-bone (Fig. 19): it is distinctly human,[1] and belongs without doubt to an animal which walked erect. But with the erect attitude is correlated the differentiation of the extremities into hands and feet, one of the most important of human characteristics.

As we have seen, the femur and skull-cap were not found close together, but separated by an interval of 50 ft.; there is thus no absolute proof that they belonged to the same animal, though in view of the extraordinary rarity both of human and simian fossil remains it would be very astonishing if they had not. This is very generally admitted, and thus the animal they represent has been fittingly designated *Pithecanthropus erectus*—the ape-man, who walked erect. It now only remains to discuss the age of this oldest known member of the Hominidæ.

[1] Yet it presents some characters which recall the gibbon. J. Bumüller, *Korrespondenz-Blatt Deutsch. Anthrop. Ges.*, 1899, xxx, p. 157, and H. Klaatsch, *Verh. d. Anat. Ges. Bonn*, 1901, p. 121; but see also D. Hepburn, "The Trinil Femur," *J. Anat. and Phys.*, vol. xxix.

It has been stated that the exostosis of the femur (abnormal growth of bone) must have crippled its owner, but Schwalbe asserts that he has observed a precisely similar case in an old man of fifty-two years, and further that the growth is intermuscular and would not interfere with movement. G. Schwalbe, *Zeits. f. Morph. u. Anthr.*, Bd. xxi, p. 290 ff., 1921.

The stratified series which forms the country around Trinil is represented in the accompanying column, which is constructed from the observations made by M. Dozy in the neighbourhood of Padas Malang (Fig. 27), north of Trinil.

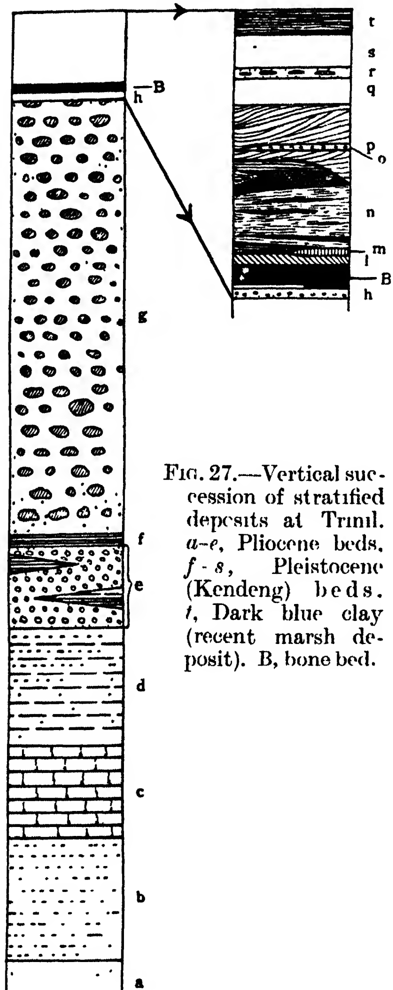


FIG. 27.—Vertical succession of stratified deposits at Trinil. *a–e*, Pliocene beds. *f - s*, Pleistocene (Kendeng) beds. *t*, Dark blue clay (recent marsh deposit). B, bone bed.

The bed of marl at the base (*b*) is rich in fossil shells (Oliva, Pleurotoma, Murex and many others), and the succeeding bed of coral limestone (*c*) is also fossiliferous, Echinoids of the families Clypeæsteridæ and Spatangidæ being especially numerous.

Then follows a bed of marl (*d*) in which fossils are rare, and a bed of clay (*e*) which completes this part of the series. All the beds so far lie conformably one on the other.

The next member of the series is a local deposit of river gravel which is markedly unconformable to the underlying beds, but where this thins out and disappears its place is taken by a bed of weathered volcanic tuff (*f*) which restores the conformability of the succession and passes gradually into a very thick deposit of conglomeratic tuff which shows no sign of weathering

(*g*). On the top of this is a thin layer of hard conglomeratic tuff with local patches of a black clay containing fresh-water fossils (Melania).

Then comes the Bone bed (B) with Pithecanthropus and the remains of a rich fauna.

The Bone bed is overlain by a layer of lapilli, succeeded by tuff and clay which has afforded remains of plants. A variable succession of volcanic ashes and tuff (*m.* to *s.*) completes the series.

The unconformity which marks the appearance of the bed of river gravel has been taken as a convenient line of separation between the Tertiary and Pleistocene series. The Tertiary beds were originally regarded by

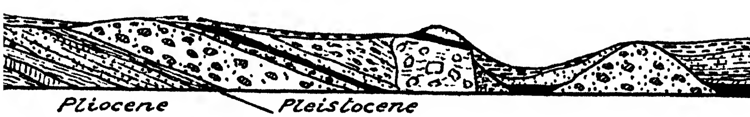


FIG. 28.—Section at Trinil showing the dislocation of the strata. The bone bed is represented by the thick black line.

Dubois as Miocene, but as they contain 67 per cent. of living species (54 per cent. if extinct varieties are taken into account) they have since been transferred to the Pliocene system.

The Pleistocene series (Kendeng beds) has shared in the movements of the land which have tilted the whole stratified series out of its orginally horizontal position so that it now dips from north to south at an angle of 6° to 8° in Padas Malang, and as much as 12° to 15° near Trinil. Further than this, the same movements have broken up the land into blocks which have been displaced along the lines of fracture; the bone bed consequently has ceased to be a continuous stratum, and lies in disjointed segments, as shown in the accompanying section (Fig. 28).

Finally, after these movements had ceased the land was worn away by erosion and then covered over large areas by a mantle of black clay, which lies on the denuded edges of Pliocene and Pleistocene strata alike and contains brackish-water and marine shells.

The history recorded by these changes is suggestive of a considerable lapse of time since the formation of the Bone bed, but for more definite evidence we must turn to the fossils it contains.

Of these the Mammalia are the most important. They are represented by many species, not one of which, according to Prof. Stremme,[1] is still existent: all are extinct. They have been assigned to twenty-one genera, of which no less than six are extinct, and eleven, though surviving elsewhere, are no longer found in Java. Prof. Jaeckel assigns the tortoises to five species, which he regards as new, for though closely related to living forms they are not precisely the same.

If these facts stood alone we could scarcely refuse to place the Kendeng beds in the Pliocene system, but the associated plants and fresh-water shells point to a more recent date.

Dr. J. Schuster[2] has described fifty-four species of plants which are all still living, though more than a half (thirty) have ceased to exist in Java. They are supposed to indicate a moist climate, 3° C. to 6° C. colder than the present. A similar flora is said to flourish in Assam at a height of 750 to 1200 m. On this evidence Schuster concludes in favour of an early Pleistocene age.

The fresh-water univalve shells were examined by

[1] H. Stremme, "Die Saugetierfauna der Pithecanthropus-Schichten," *C.B.f. Min. u. Geol.*, pp. 54–60, 83–90; and in Selenka and Blanckenhorn, *op. cit.*, pp. 82–150, 1911.

[2] J. Schuster, "Ein Beitrag zur Pithecanthropus-Frage," *S. B. Kgl. bayerische Ak. d. Wiss.*, Munich, 1909, and in Selenka and Blanckenhorn, *op. cit.*, p. 235.

Dr. H. Martin,[1] who found that out of sixteen species no less than fourteen are still living; of the bivalves Dr. Branca describes one species of Unio as new.

The evidence is thus singularly conflicting, but great weight attaches to that afforded by the Mammalia, and with this to guide us we can scarcely be far wrong if we assign Pithecanthropus to the Sicilian age, that is, to the dawn of the Pleistocene epoch.

Our efforts to trace the history of the human family back into a remote past have taken us so far as this. Of the bodily remains of any earlier Hominid we have no knowledge.

But another kind of evidence still awaits us.

[1] H. Martin, "Das Alter der Schichten von Sondé und Trinil," *Verlag Virgrad. Wiss. Nat. Kon. Akad. v. Wet.*, Amsterdam, 1908, and in Selenka and Blanckenhorn, *op. cit.*, p. 52.

CHAPTER III

EOLITHS

LET us now turn our attention to another class of facts. The operations of the mind no doubt find their noblest expression in the language of speech, yet they are also eloquent in the achievements of the hand. The works of man's hands are his embodied thought, they endure after his bodily framework has passed into decay, and thus throw a welcome light on the earliest stages of his unwritten history.

It is now over two centuries (1690) since John Bagford[1] discovered in some excavations made in Gray's Inn Lane, London, the flint implement represented by Fig. 29. That it was an implement, the work of man's hands, seemed obvious enough, and an elephant's tooth which was found along with it provided a very plausible date, for the remains of elephants which were, then as now, not uncommonly met with in digging into gravel were generally regarded as relics of the Roman occupation.

A century later (1797) John Frere[2] obtained a large number of similar implements from a depth of twelve feet below the ground at Hoxne in Suffolk. He also recognised their true nature and concluded that they were fashioned at some very remote period by a people unacquainted with the use of metals.

[1] John Bagford, 1690; see Leland, *De Rebus Britannicis Collectanea* vol. i, p. lviii; Oxford, 1715.
[2] John Frere, *Archæologia*, xiii (1800), p. 204.

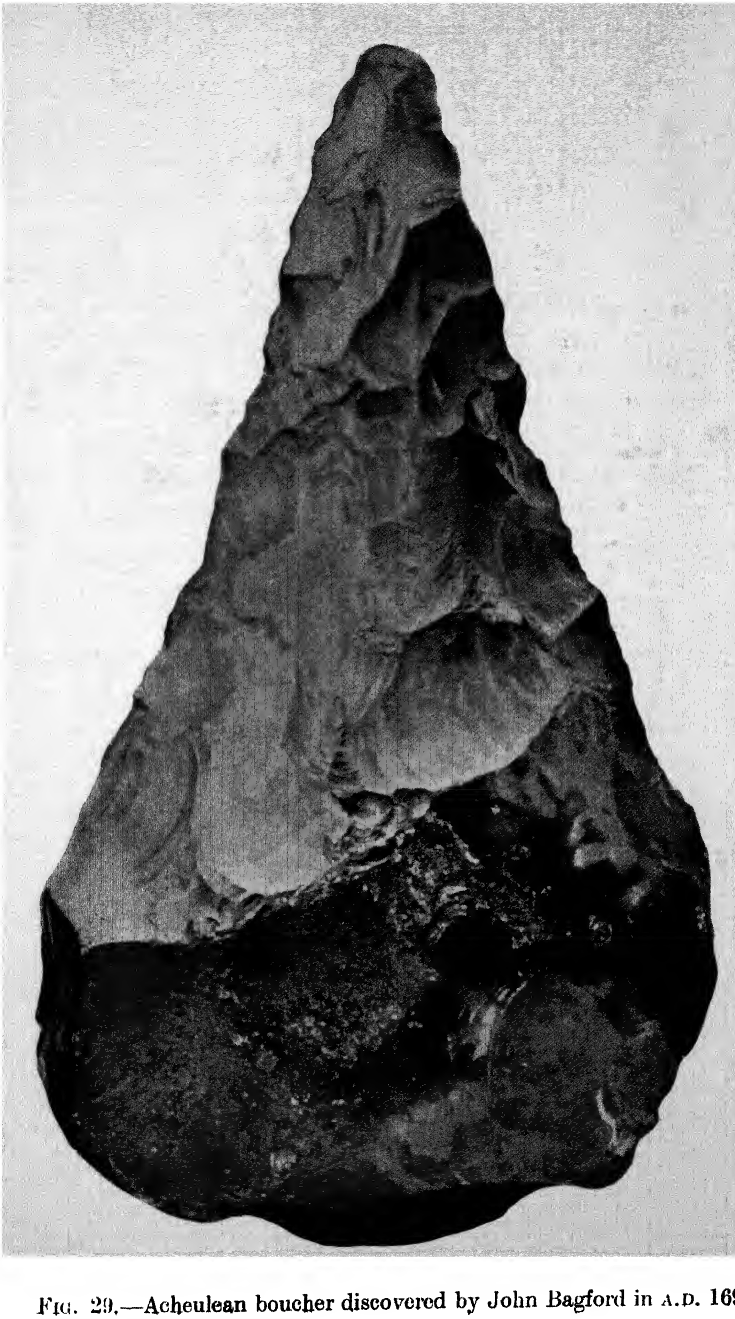


FIG. 29.—Acheulean boucher discovered by John Bagford in A.D. 1690.

These isolated discoveries and others[1] like them ended where they began and bore no fruit. For their fructification the fertile soil which an elementary knowledge of the history of the earth and its inhabitants would have afforded did not as yet exist. So little indeed was their significance suspected that the accepted belief in the recent creation (4004 B.C.)[2] of Adam was in no wise disturbed, no prejudices were aroused to embarrass the judgement of the early discoverers and consequently they had no difficulty in recognising the flint implements for what they actually were.

This period of indifference was not destined to endure for long. The nineteenth century witnessed the birth of Geology and Palæontology and the troublous years of their early growth. By the middle of the century they had so greatly extended our knowledge that when Boucher de Perthes[3] made known his famous discovery of flint implements and the bones of the mammoth and other extinct animals mingled together in the diluvial gravels of the Somme at Abbeville, it was no longer possible to treat the subject with neglect.

The discovery was of course warmly welcomed? By no means; on the contrary, it was the signal for battle. Boucher de Perthes was attacked on all sides, by the scientific world which was under the spell of the great Cuvier, and by a host of zealous defenders of Archbishop Ussher's chronology.

Cuvier was a man of commanding genius, his contri-

[1] For the history of discovery in this subject see Moritz Hoernes, *Natur- und Urgeschichte des Menschen*, Vienna and Leipzig, 1909, vol. i, p. 35 *et seq.*, and Marcellin Boule, *Les Hommes Fossiles*, Paris, 1923, 2nd Ed., p. 1 *et seq.*

[2] And more precisely the 23rd day of the month of March. The Kalendar of St. John's College in Queen's College Kalendar, Oxford, 1910, p. 122.

[3] Boucher de Perthes, *Antiquités celtiques et antédiluviennes*, Paris, 1847–1860. Although this date 1847 is printed on the title-page of the first volume it was not published till 1849.

butions to science were immense, but on this question his attitude was already determined by a preconceived system, according to which the existing population of the world, including man himself, "the most perfect work of God," is the product of the last period of creation; the mammoth and the vast assemblage of living forms contemporary with it belonged to the preceding period and were all destroyed together by a universal deluge[1] which left behind the deposits of gravel in which their remains are now found embedded.

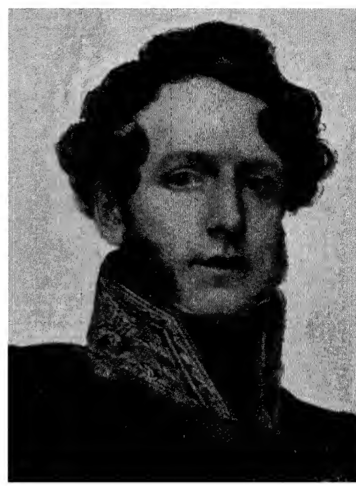


FIG. 30.—Portrait of Boucher de Perthes taken from a lithograph.

Those deposits of gravel which contain the remains of extinct animals were therefore included by Dean Buckland in a single formation which he named the "diluvium," a term still generally used in Germany, while those which contain the remains of recent animals were distinguished by him as "alluvium." Thus *ex hypothesi* it was useless to look for remains of man in the diluvium, and if it was asserted that they had been found there, it was far more likely, in the opinion of Cuvier, that the observations were in error than that the hypothesis was unsound. This position he defended with great sagacity and exemplary fairness.[2]

[1] This was not the Noachian deluge, but one supposed to have preceded it.
[2] E. Cartailhac, "Georges Cuvier et l'ancienneté de l'Homme," *Materiaux pour l'hist. nat. et primitive de l'Homme*, 1884, p. 27.

To find an apology for some of his supporters is less easy. Prejudice was now fully awakened. For the first time it was found possible to assert that such finished implements as those of Abbeville, and consequently of Gray's Inn Lane and Hoxne, had not been fashioned by man, or, if they had, that they must originally have been made of iron and subsequently converted into stone!

But when it comes to a decisive struggle even prejudice must succumb to facts, and so after a controversy which had lasted some fifteen years, during which every conceivable objection had been raised and met, the existence of man in the antediluvial "epoch of creation" was at length accepted as an assured truth.[1]

Thus liberated from the obscurantism of the Middle Ages, Science was prepared to take up the story of man's development from where the Greeks had left it, and here once more we have to admire that clarity of vision which distinguished those philosophers who were the first to adumbrate the hypothesis of atoms:

> "Hands, nails and teeth, man's earliest arms,
> And stones and broken boughs of trees.
> Then flames and fire he next found out,
> And later learnt the strength of iron and bronze.
> But bronze was known the first,
> Since it easier melts and more abounds."[2]

[1] It might be thought that Boucher de Perthes could easily have met Cuvier's arguments by asserting that the flint implements were the work of an extinct species of man, as indeed they were. How far he was in advance of his time is shown by the fact that he actually did so. He says he does not believe that post-diluvial men were descended from pre-diluvial men, any more than existing elephants from extinct ones. The human race has several times been renewed with *modifications* analogous to the animals which were its contemporaries. This is entirely in the Cuvierian vein. B. de Perthes, *op. cit.*, p. 244.

[2] "Arma antiqua, manus, ungues, dentesque fuerunt,
Et lapides et item silvarum fragmina rami,
Et flammæ atque ignes postquam sunt cognita primum;
Posterius ferri vis est, ærisque reperta,
Sed prior æris erat quam ferri cognitus usus,
Quo facilis magis est natura et copia maior."
LUCRETIUS, Lib. v, 1282.

We have already seen how unprejudiced observers recognised Bagford's boucher at once as an implement of human workmanship. On this point they were agitated by no doubt. The implement speaks for itself; in the first place it possesses a simple symmetrical form, and next it is produced by the harmonious union of a multitude of separate flakings, each the result of a directed blow. Chance is evidently excluded; there is evidence of design, and since the implement bears a not remote resemblance to the head of an axe, its "final cause" seems clearly indicated. When later on a great number of similar objects were found congregated together in a limited area, as at Abbeville, the evidence became irresistible.

Having familiarised ourselves with the boucher, we have no difficulty in tracing the progress of human invention from the Chellean age up to historic times when explorers in remote lands found primitive peoples still making and using their stone implements in default of metal, which was unknown to them.

Our present task, however, is to proceed in the opposite direction, from the Tyrrhenian age, with its bouchers, to a still more primitive past, and here we soon begin to encounter great difficulties. We are no longer opposed by hostile prejudice, rather we shall have to keep a close watch upon ourselves lest our own preconceptions should betray us into a too facile acceptance of specious evidence.

The difficulty is inherent in the subject itself: the Chellean boucher is a work of art, every touch tells of intelligent design; but it was not achieved all at once. Even its immediate predecessors are much ruder forms; in still earlier implements all special resemblance to it is lost, and at length, as we proceed farther into the past,

we discover broken flints which certainly might have been chipped or used by man, but just as certainly might not. Nature graduates nicely into art and at present we have no criterion by which to determine where one ends and the other begins. But this is a limit, and before we reach it a wide field of investigation lies open before us. Its exploration, which is our present task, is of great importance, for it bears upon the problem of human evolution.

Without weapons man is but a feeble creature: the most powerful athlete, or even a company of athletes, would stand but a poor chance against the tiger of the jungle.

The safety of the ape is provided for by natural weapons and adaptation to his environment; man protects himself by the arms he has invented and the sagacity which he brings to the use of them. But those intermediate forms by which the passage from apes to men was accomplished, how was their safety ensured?

Several solutions of this problem have been proposed. Some have imagined that man passed through the defenceless stages of his evolution in a terrestrial paradise, where, sheltered from a hostile world, he passed his time in intellectual growth and learnt to speak by listening to the song of singing birds; others hold that the earliest Hominids were derived from powerful apes like Dryopithecus and retained their ancestral weapons of defence until they had substituted for them inventions of their own.[1] Yet others, finally, have supposed that a precocious development of intelligence, adequate for the fabrication of implements, had started some primitive

[1] The intelligence of the higher apes is considerable, and even baboons, who are indeed very clever, have been said to strike one another with stones in play.

lemur, a lowly member of the Primates, on a fortunate career, which, pursued in isolation, and uncontaminated by intercourse with the apes, had issue in the appearance of man.

The first hypothesis, which was advocated by Klaatsch, may be summarily dismissed as a mere fantasy, unsupported by any shred of evidence and opposed to many well-established facts. The second is most in accordance with the teaching of comparative anatomy, palæontology, geology and geography. The third and last has the balance of anatomical evidence against it, but if stone implements could be proved to occur low down in the Tertiary Series, in the Oligocene strata, for example, it would have a claim upon our serious consideration.

We will proceed then to consider the question of eoliths—a name proposed by de Mortillet[1] for supposed stone implements of earlier age than the Pleistocene—and begin with their occurrence at Thenay.

Thenay.—One of the earliest investigators in this field was the Abbé Bourgeois,[2] who in 1867 discovered a number of broken flints in beds of Upper Oligocene age near Thenay, a village situated south of Orleans in the department of Loir-et-Cher. M. Bourgeois was of opinion that they had been shaped by man, and he observed a peculiar crackling of the surface which he attributed to the action of fire. Distinguished in-

[1] G. de Mortillet, *Le Préhistorique*, Paris, 1st Ed., 1883, p. 18.

[2] Bourgeois, "Sur les Silex considérés comme portant les marques d'un travail humain découverts dans le terrain Miocène de Thenay," *Congr. d'Anthr.*, Brux., 1872, pp. 81–92. Ch. Bouchet, "Les Silex de Thenay," *Soc. Archæol. du Vendomais*, 1883. G. de Mortillet, "Silex de Thenay," *Bull. Soc. d'Anthr.*, Paris, 1883, p. 852. E. d'Acy, "Du pseudo-taillé Silex de Thenay," *Bull. Soc. d'Anthr.*, Paris, 1885, p. 173. L. Capitan, *Rev. de l'École d'Anthr.*, tome xi, 1901. Prof. Capitan, after studying a collection of 2500 of these flints which he had brought together rejects them as artefacts.

vestigators, d'Omalius, d'Halloy, de Quatrefages, and G. de Mortillet, not to mention others, shared the opinion that they showed evidence of intelligent design; equally distinguished authorities, Virchow, Desor, and Fraas, maintained the contrary. De Mortillet believed that they had been made not by any species of Homo, but by a semi-human precursor which he named *Homosimius bourgeoisii.*

FIG. 31.—Asserted Eoliths from the Oligocene of Boncelles. *a, a'*, scraper with well-marked notch; *b*, awl with oblique point; *c, c'*, flake with bulb of percussion and a point between two notches retouched over the same face. (After Rutot. × ½ about.)

Few if any archæologists take these eoliths seriously at the present day: they are such as may be readily produced by natural causes. The "crackling" is clearly the effect of fire. I have myself seen an abundance of flints in the gravels of Hampshire which had been crackled by a great conflagration of furze and heather, which had swept over a wide extent of country.[1]

Boncelles.—More recently, M. E. de Munck [2] and

[1] According to my experience crackling cannot be produced by suddenly cooling flint after boiling it in water or even after heating it to 140° or 180° C.: under the latter treatment it may crack, but not crackle.

[2] E. de Munck, "Les alluvions à éolithes de la terrace supérieure de la vallée de l'Ourthe," *Bull. Soc. Belge de Géol.*, xxi, 1907, Pr.-verb,

M. A. Rutot[1] have discovered abundant chipped flint flakes (Fig. 31), which they regard as representing an eolithic industry, in pebble beds of supposed Middle Oligocene age.

The interest aroused by the facts as described by M. Rutot has led many excellent observers to visit the locality, and some years ago it was very thoroughly investigated by a party consisting of M. Bonnet, M. Bracht, and Prof. Verworn. The result of their inquiry was published by Prof. Verworn,[2] who, although himself an ardent champion of the existence of other eoliths, was persuaded that in this instance all the characters which have been supposed to indicate intentional flaking can be better explained by movement under pressure due to the weight of superincumbent strata. A similar opinion is held by Profs. Boule, Breuil, Capitan and numerous other observers.[3]

This conclusion is in complete harmony with that which is suggested by general considerations and especially by what we know of the general course of animal evolution. Thus the ancestral horse of this epoch (Middle Oligocene) was the three-toed Mesohippus, a small animal only eighteen inches in height; the ancestral elephant was the pygmy Mœritherium, about the size of a pig and more closely approaching that animal in some points of its anatomy than its highly

[1] A. Rutot, "Un grave Problème," *Bull. Soc. Belge de Géol.*, xx, 1907, Mém., also "Une industrie éolithique antérieure à l'Oligocène supérieure ou Aquitanien," *Congr. préhistorique de France*, 1908, 4e sess., Chambéry, pp. 90–104, 1910.

[2] Max Verworn, *Archiv f. Anthr.*, *N.F.*, xi. *Korrespondenz-Blatt Deutsch. Ges. Anthr.*, p. 36, 1910. See also R. Bonnet and G. Steinmann, "Die 'Eolithen' des Oligozans in Belgien," *S.B. Niederrhein Ges. f. Natur.-u. Heilkunde zu Bonn*, *Naturw. Mitth.*, 1909. This memoir contains a short bibliography of eoliths.

[3] After a careful study of a typical collection of these flints, obtained through Prof. Rutot, I am led to the same conclusion.

specialised descendant; and the highest known ape was the little Propliopithecus of Schlosser.

So far then we have no reason to believe that a being intelligent enough to fabricate flint implements was already in existence in Oligocene times.

Before proceeding further it will be convenient to discuss the mode of fracturing of flint and the characters impressed upon it both by man and natural agencies.

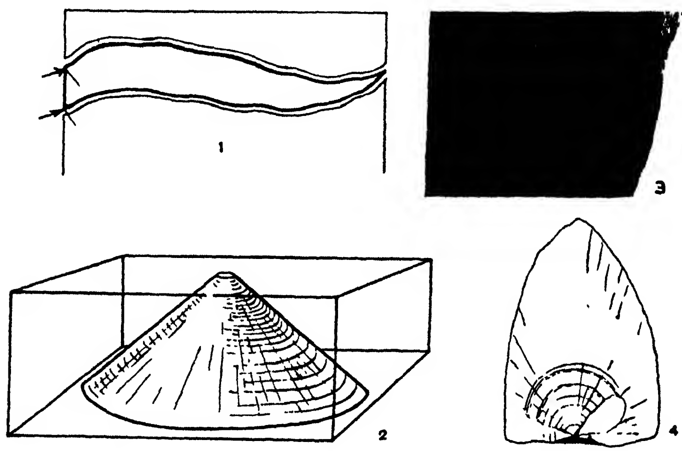


Fig. 32.—Transverse section of a block and a flake obtained by percussion (1). Cone of percussion (2). Incipient cones (3). Face of flake (4).

Bulb of Percussion.—When a fairly homogeneous, elastic, isotropic[1] solid such as flint, or glass which is even better, is struck a smart blow by a rounded point, delivered plumb to its surface, a conical fracture is produced having its axis in the same direction as the blow (Fig. 32, 2). The magnitude of the cone depends on the force of the blow. The merest tap will often suffice to produce a minute cone (Fig. 32, 3), scarcely large enough, it is true, to be seen without the help of a

[1] ἴσος, *isos*, equal; τρόπος, *tropos*, direction. Having the same properties in every direction.

lens, but of some importance since it serves as a record of the blow, and so may afford useful information on the history of a flint.[1]

When the blow is sufficiently powerful the conical fracture may traverse the whole thickness of the flint, and the cone is, as it were, punched out, leaving a conical hollow behind. In this way a skilful person can perforate a sheet of thick plate glass till it looks like the bottom of the cullender.

In order to obtain a flake from a block of flint, a flat surface known as the striking platform is first prepared, and a blow is struck at an angle of 70° (Fig. 32, 1), near the edge. The resulting cone is scarcely developed at all on one side of the point of percussion, but is well formed on the other, nearer the exterior, and passes gradually into a curved surface along which the fracture is completed. The detached flake is, of course, the counterpart of the surface just described, and the hollow it bears, which corresponds to the cone or bulb of percussion, is distinguished as the negative cone or bulb. Should a second flake be detached by a blow delivered just below the first one, that will naturally carry away the positive bulb on its upper and a negative bulb on its lower surface (Fig. 32, 1).

The cone and the swelling continuous with it form together what is known as the bulb of percussion, to which considerable importance was at one time attached, as it was supposed—erroneously—to be a sure sign of human workmanship. The fractured surface may be continued from the bulb in a simple curve or by one or

[1] When flints are carried along its bed by a stream they give and receive many blows, almost every one of which is recorded by a cone. If the surface of a flint which has been thus battered is examined under a lens it will be seen to be marked all over by circular cracks, that is, by the sides of the cones exposed at the surface.

several undulations which form a series of more or less circular arcs concentric with the apex of the cone. Thus, should the bulb be subsequently removed, as it frequently is,these undulations will enable us to recover its position (Fig. 32, 4).

Another feature of the fractured surface is the presence of fine linear striæ which radiate from the point of percussion, crossing the undulations (Fig. 32, 4). These also help to determine the position of the point of percussion since they converge towards it. The information which they and the concentric ripples thus afford may prove useful when we have to consider whether a flake has been detached by accident or design. The striæ, when examined under a lens, appear to be minute grooves or channels in the flint: on one side they are sharply defined, on the other they are continued as superficial fissures, from which the roof has been partly removed, leaving a ragged edge. They start abruptly, and are wider at their origin than their end, where they "tail off" almost imperceptibly.

A small scale is not uncommonly detached from the flake, near the cone, carrying away with it a part of the bulb of percussion (Fig. 32, 4); and leaving a mark which is generally known as an "éraillure"; "scar" would be a good English equivalent.

Such are the chief marks of percussion. The effects of pressure are similar, the chief difference being apparently that the bulb of compression is flatter or less prominent than the bulb of percussion.

Secondary Working.—After the flake is struck off it may be immediately put to use, but it is often further elaborated by trimming the edge. Minute flakes are chipped off, sometimes alternately from each side, but more often from one side only; in this way a knife is

converted into a saw. The serrated edge is the " surface d'utilisation " of Rutot--working edge; but the edge opposite to it is often removed by minute flaking, or retouched, in order to produce a flat surface which will not cut, so as to render it convenient for holding in the hand; this is the " surface d'accommodation," and Rutot remarks that in attempting to interpret a supposed implement we should first look for the working edge and then, having found it, for the " surface d'accommodation," which will be situated on the opposite side.

Patina.—Flint is a very finely granular admixture of quartz and opal. When exposed to the action of underground water the opal is dissolved away, leaving the quartz unaffected.

In the first stage of patination, when but very little opal has been removed, the quartz granules form an almost infinitely thin film and the black flint showing through gives a faint blue colour to the surface: this is the well-known blue patina.

With the flow of time and the continued action of the solvent the opal is further removed till the quartz forms a porous layer of considerable thickness; it may be as much as a quarter of an inch or more. The patina is then a dead white with a matt surface.

If, as often happens, the percolating water contains iron in solution, this may be deposited in the pores as a ferric hydrate, which confers a red or yellowish colour on the patina.

Finally, the water may contain silica in solution and deposit this in the pores and on the surface of the patina, which then acquires a brilliant polish.

The patina has this importance; if the several flaked surfaces which form the exterior of a flint have all been produced *at the same time, as they will have been in*

The flints are thus exposed to a succession of violent impacts during a space of twenty-six hours, the time required to secure adequate mixture. When the operation is ended the mud is drawn off, and the flints remain at the bottom of the vat. Some have been converted into true pebbles; others, according to M. Boule, present all the characteristic features of supposed eoliths—the same bulbs of percussion, pointed ends, curvilinear notches, and edges broken by "retouches." They are "of extraordinary perfection, and appear to be the result

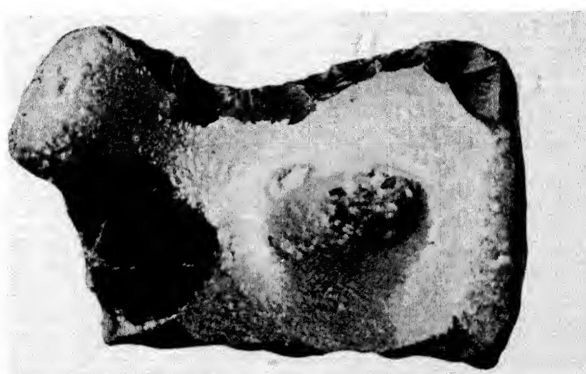


FIG. 33.—Flint with marginal chipping from the cement works of Mantes. (Nat. size.) After Boule, *L'Anthr.*

of fine workmanship" (Fig. 33). Some of the specimens in M. Boule's collection, which he was kind enough to show me, are even more deceptively similar to true artefacts than would be judged from the published illustrations.

In this process, the rake plays the part of the pebbles in a stream having, as we have said, the same velocity as the Rhône in flood; in a torrent, where the fragments of stone would be exposed to more violent blows for a shorter time, we might expect coarser flaking to be produced, but no observations so far as I am aware

have as yet been made on this point. It is to be hoped that some geologist will turn his attention to the subject.

Action of the Sea.—At the foot of the chalk cliffs which bound our southern coast there is many a sea beach consisting of flints derived directly from the cliffs themselves.[1] If we search over these we shall soon discover broken fragments which resemble to some extent genuine artefacts, but they are usually less coarsely flaked, and otherwise sufficiently different to preclude a precise comparison. This is because the beach of which they form part consists of loose material, so that the force of the falling waves, instead of fracturing and flaking individual flints, is dissipated in producing a general movement of the shingle. How difficult it is to break a stone lying on loose pebbles is known to everyone who has made the experiment with a hammer.

But there are some favoured spots on the south coast—Selsey Bill is one of them—where flint nodules lie scattered in thin widespread sheets on the surface of the Bracklesham clay. They are visible at low tides in those places where the sea has washed away the overlying Pleistocene deposits.[2] Many of them are partly embedded in the clay which holds them in place while under the impact of the waves, so that when an occasional stone is hurled against them it produces its full effect, striking off large flakes with characteristic conchoidal fracture and bold bulbs of percussion.

Some are so firmly rooted that they have retained

[1] For other cases see G. Coffey, "Naturally Chipped Flints for Comparison with Certain Forms of Alleged Artificial Chipping," *Rep. Brit. Assoc.*, 1901, p. 795.

[2] Clement Reid, "The Pleistocene Deposits of the Sussex Coast," *Quart. Journ. Geol. Soc.*, 1892, xlviii, pp. 344–364; *ibid.* "The Geology of the Country round Bognor," *Mem. Geol. Surrey*, 1897, no. 332, p. 9, and H. Dewey, "The Raised Beach of North Devon," *Geol. Mag.*, 1913, Dec. 5, vol. x, p. 157.

their place while receiving repeated blows, delivered from one direction only, that of the incoming waves, and have thus acquired a one-sided marginal flaking.

The sea began to shape these nodules long ago, probably in Middle Pleistocene times, and it is continu-

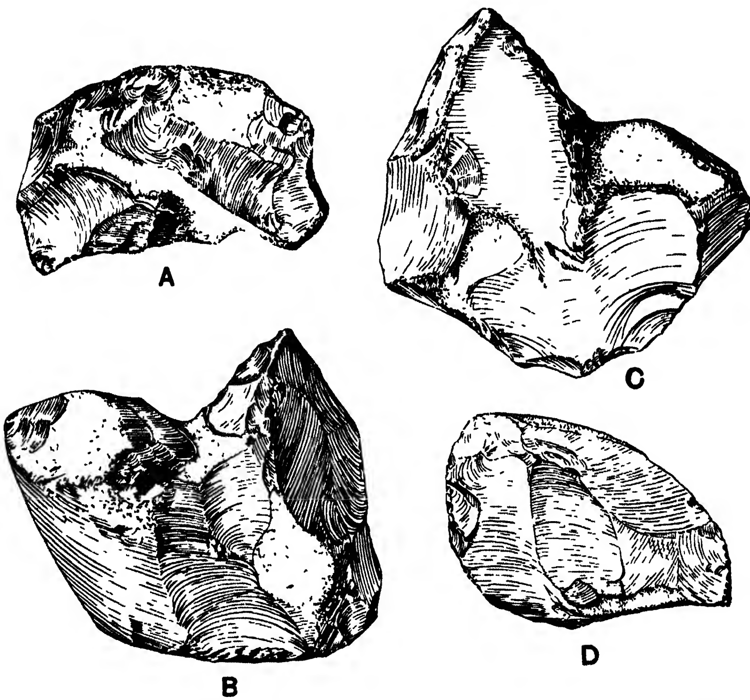


FIG. 34.—An irregular nodule with a rostro-carinate process, from Selsey Bill. Two processes extend from the body of the nodule; both are chipped and one of them is rostro-carinate in form. A, left lateral view of the rostro-carinate process; B, dorsal view of this process and the nodule; C, ventral view; D, right lateral view of the rostro-carinate process. (× about ½.) (From the collection of Mr. Heron-Allen.)

ing its work at the present day; hence the fractured surfaces they display are of very different age, a fact to which their patination testifies, for some are deeply patinated, some but slightly, and others not at all. Prof. Breuil has called my attention to a similar though

not so marked a difference in the patination of the facets of the Red Crag flints.

Among the many forms which may have resulted from this action of the sea, the rostro-carinate (to be referred to later, see Fig. 40) is conspicuous; several examples have been found by Mr. E. Heron-Allen, and under his guidance I have collected some myself. One has already been described by Sir E. Ray Lankester.

More interesting are some large and unwieldy nodules still retaining their original irregularity of form with elongated rounded processes projecting from them. These processes have been battered by the waves and have yielded in the same manner as the simple nodules which have acquired the rostro-carinate form.[1] They are broken along surfaces which sometimes do and sometimes do not intersect; when they do, a rostro-carinate form (Fig. 34) is the result and this projects from the side of the ill-shaped nodule in a manner as difficult to associate with design as it is easy to interpret by the action of known natural causes.[2]

The Selsey flints, like those at the base of the Red Crag near Ipswich, are scored over the surface with coarse scratches, and Mr. Clement Reid considers that they have been subjected to the action of floating ice, which has driven them forcibly into the underlying clay and sometimes crushed them into fragments. It is thus quite possible that some of the oldest flaking may have been produced by the same powerful agency.

[1] "The Formation of 'Rostro-carinate' Flints," *Report Brit. Assoc.*, 1913, p. 788.

[2] Attention may here be called to a curious fallacy, which is specious and therefore widely prevalent. Because a flint is found to fit the hand it is concluded that it was designedly shaped to do so; but, as Mr. Henry Balfour long ago pointed out, it is not so much the flint that fits the hand as the hand that fits the flint. A stone that does not fit the hand is the exception rather than the rule, and as an example of such an exception we may cite the nodules here referred to.

We have still much to learn both of shore ice and the sea before we can rightly judge of their power in the forging of spurious implements.

Effects of Pressure.—The observations of Mr. Warren may be first cited.[1] These show that the flints of a newly mended road are often broken by cartwheels into forms which closely resemble those of some supposed eoliths. A small pebble lying against a larger fragment determines the formation of an incision or notch, and the surface of this is broken up into facets which recall secondary flaking; in this way the simulacrum of a hollow scraper is produced. Two adjacent pebbles may produce a double notch with an intervening projection looking like a boring point. The pressure of the cart-wheel is represented in nature by superincumbent beds, glaciers, or soil creep. That some supposed eoliths have been produced by movement of the soil was also maintained by Commont.[2]

But by far the most important evidence under this head is afforded by the remarkable observations of Prof. Breuil [3] on the flints of the Lower Eocene sands (Thanétien) at Belle-Assize, Clermont (Oise). These flints include many eolith-like forms, and M. Breuil shows in the most convincing manner that they all owe their formation to one and the same process, due to movements of the strata while settling under pressure on a yielding foundation; *i.e.* the chalk which is slowly but continually being removed in solution. The flint nodules crowded together in a single layer are squeezed

[1] S. Hazzledine Warren, "On the Origin of Eolithic Flints by Natural Causes, &c.," *Journ. Anthr. Inst.*, 1905, xxxv, N.S. viii, pp. 337–364, Plate. See also Max Verworn, *loc. cit.*

[2] M. Commont, "A propos d'Éolithes," *Congr. préhistorique de Fr.*, 1909.

[3] L'Abbé H. Breuil, "Sur la présence d'Éolithes à la base de l'Éocène Parisien," *L'Anthr.*, 1910, xxi, pp. 385–408.

forcibly one against the other, and as the difference in pressure to which they are subject increases with the withdrawal of the underlying support, they give way by fracturing. The process is accompanied by the formation of éraillures and bulbs of "percussion," the latter differing only from those due to blows by being flatter or less prominent. In some cases great flakes are split off, and it sometimes happens that these still remain associated with the parent nodule, apposed to

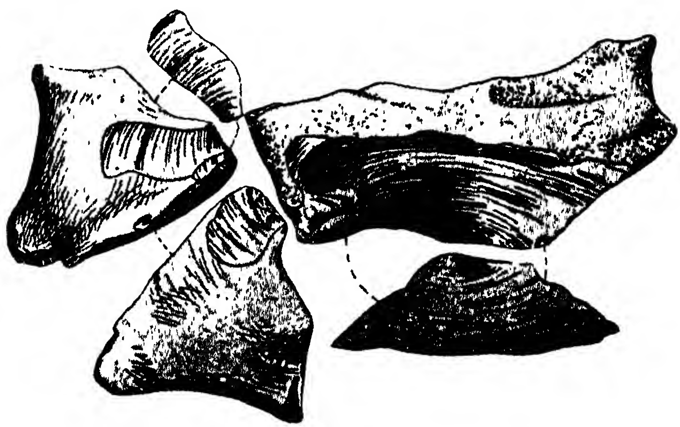


FIG. 35.—Associated fragments of flints from the Thanet sands of Belle Assize (Oise) produced by flaking *in situ*. (After Breuil. × about ½.)

the surface from which they have been detached (Fig. 35), thus affording decisive evidence of fracture in place. In other cases a clean fracture severs the nodule into two parts, and not infrequently the readjustment to pressure continues after the fracture has taken place, so that the raw edges of one fragment are scraped against the face of its fellow and a peculiar flaking results which is scarcely distinguishable from the characteristic retouch of genuine Mousterian implements[1] (Fig. 36, 3). As this process has been active

[1] See Fig. 96, p. 204.

during a very long period, so the flakes have been produced at very different dates; some are ancient, and these are distinguished by a dense patina; others are recent, and the fractured surfaces of these are perfectly fresh, with no trace of patination.

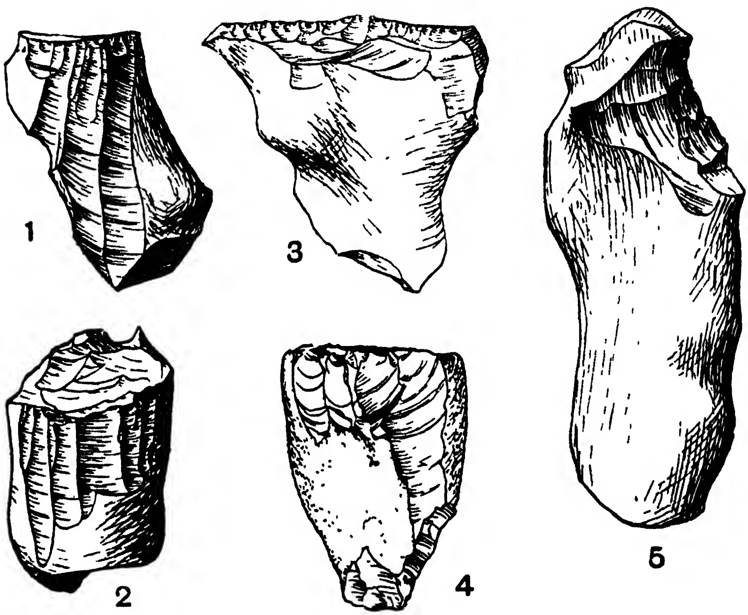
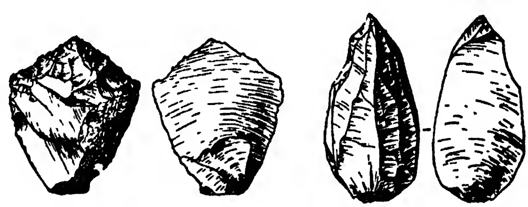


FIG. 36.—Nos. 1, 2, 3 and 5, simulacra of implements from Belle Assize; 3 with marginal chipping which resembles the Mousterian retouch. (After Breuil, *L'Anthr.* × ⅔.) 4 from the Red Crag, Foxhall Hall, for comparison with 2. (After Reid Moir × ⅔.)

The forms of the flakes vary widely, ranging like the supposed Tertiary eoliths from the obviously purposeless to those which simulate design and bear bulbs of percussion and marginal retouches. Among the most artificial-looking are a few which present an astonishing degree of resemblance to special forms of genuine implements; attention may be directed to two in particular, which are compared by the Abbé Breuil, the

one (*a*, Fig. 37) to Azilio-Tardenoisian flakes, and the other (*b*, Fig. 37) to the small burins of Les Eyzies; in their resemblance to artificial forms these simulacra far transcend any "eoliths" which have been found on other horizons of the Tertiary series.[1]

Flints which have been fractured by movements under pressure are frequently scored by superficial scratches, but the presence of such scratches is by no means decisive evidence, for they occur on some genuine implements and are absent sometimes on flints which have been flaked by pressure.



a *a′* *b* *b′*

FIG. 37.—Naturally-formed flint-flakes simulating artefacts from the Thanet sands of Belle Assize. *a a′* resembles Azilio-Tardenoisian flakes; *b b′* resembles some of the small burins of Les Eyzies. (After Breuil, *L'Anthr.* Nat. size.)

Selection.—Before leaving this subject some reference should be made to selection, an influence which will appeal to all good Darwinians.

In deposits which contain supposed eoliths many stones will be found with bold flaking suggestive of human agency, but of a form which is inconsistent with this suggestion and evidently excludes them from the category of artefacts; on the other hand, some will be found with a suggestive form but devoid of characteristic flaking. The collector will naturally reject all these

[1] These observations have since been confirmed and extended by Mr. Hazzledine Warren, "A Natural 'Eolith' Factory beneath the Thanet Sand," *Quart. Journ. Geol. Soc.*, vol. lxxvi, pp. 238–248, one pl.

specimens. On the other hand, in such an assemblage a certain number of examples may exist in which both suggestive form and flaking are combined. These are the specimens which the collector will certainly select, and no harm done, so long as the rejected specimens are not also neglected, but fairly taken into account before arriving at a final judgement. The danger is that a partisan may overlook this duty. Partisans are not all of one party; it is possible to make a selection of the obviously natural specimens and to unconsciously overlook those which would make more appeal to the other side.

Let us now resume our inquiry into the antiquity of the Hominidæ. We will begin with the Miocene epoch.

Otta.—Fragments of quartzite and flint were next found by Carlo Ribeiro[1] in lacustrine beds of Upper Miocene age at Otta, a village not far from Madrid. These have been attributed by G. de Mortillet to another species of Homosimius: *H. ribeiri.*

I have not seen specimens from this locality, but judging from illustrations I think some of them resemble "atypique" flakes of the Lower Palæolithic industries.

Puy Courny.—The Upper Miocene of Puy Courny, near d'Aurillac, in the department of Cantal, Auvergne, has also furnished numerous flints of supposed human workmanship. They were discovered by J. B. Rames[2] in 1877, and from that time to this the locality has proved a battle-field for contending opinions, the combatants on each side being equally confident in

[1] C. Ribeiro, "Descripção de alguno silex a quartzites lascádos encontrados nas camadas dos terrenos terciario e quaternario," Lisboa, 1871; and *Congr. d'Anthr.*, Bruxelles, 1872, p. 95, plates 3–5.

[2] J. B. Rames, "Géologie du Puy Courny," in *Matériaux pour l'histoire naturelle et primitive de l'Homme*, 1884, pp. 399–403.

the strength of their cause. There is no doubt as to the palæontological horizon from which the flints have been obtained: it is unquestionably Upper Miocene, and has furnished remains of extinct mammals, such as *Dinotherium giganteum*, Kaup; *Mastodon longirostris*, Kaup; *Rhinoceros Schleiermacheri*, Kaup; *Hipparion gracile*, Kaup. The sole point in dispute is whether the flints have or have not been fashioned by man or a precursor of man. The accompanying illustration (Fig. 39, 3, 4) represents two of these supposed artefacts.

The veteran anthropologist de Quatrefages asserts that if these forms had been met with in Pleistocene deposits no one would have doubted their artificial nature. Prof. Verworn,[1] after a close examination of the flints obtained in his excavations, concludes that 24 per cent. show "indubitable signs" of workmanship, and in the adjacent locality of Puy de Boudieu even 30 per cent.; about half are classed as "doubtful," and only 15 to 20 per cent. as of inorganic origin. Like Prof. A. Rutot, who thinks he can recognise the special purposes for which these fragments were used, classifying them into hammers, anvils, scrapers, burins, missiles, Prof. Verworn regards them as proof of a fairly well differentiated culture, and he concludes that at the close of the Miocene epoch the valleys of the Cantal were peopled by beings who were already familiar with "the art of splitting flints by blows and the formation of implements by comparatively fine marginal chipping under the action of skilfully produced rebounds." Prof. Capitan has also arrived independently at a similar conclusion. G. de Mortillet, while agreeing as

[1] Max Verworn, "Die archæolithische Kultur in der Hipparionsschichte von Aurillac, Cantal," *Abh. d. K. Ges. d. Wiss.*, Göttingen, 1905, N.F., iv, no. 4, 56 pages, 5 pls.

to the artificial character of these forms, attributed them to the hypothetical Homosimius, and distinguished a new species—*H. ramesii.*

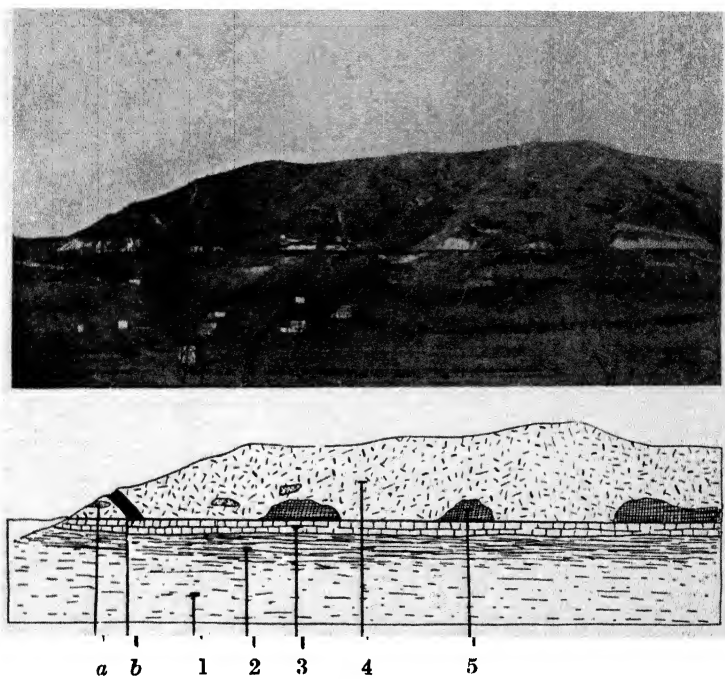


FIG. 38.—Le Puy de Boudieu, seen from Caillac. (After a photograph by M. P. Marty.)

Below a geological section of the Puy. 1. Red Clay (Lower Tongrian); 2. Marls (Upper Tongrian); 3. Limestone and marl (Aquitanian); 4. Trass, an andesitic conglomerate (Pontic to Plaisancian); 5. Fragments of andesitic breccia in the Trass and of the same age; *a*, Pontic sands with eoliths, included in the Trass; *b*, Basalt dyke. (After L. Mayet.)

On the other hand, M. Marcellin Boule is unable to perceive any signs of intelligent workmanship, and one of the latest investigators of Puy Courny, Dr. Lucien Mayet,[1] concludes that natural agents, such as variations

[1] Lucien Mayet, "La Question de l'Homme Tertiare," *L'Anthropologie*, xvii, pp. 641–668, 1906.

of temperature, torrential rushes of water, subsidence of the deposits, and no doubt others of which we are ignorant, have played the principal part in the formation of the " eoliths " of Cantal.

Such also was my own opinion, formed after the examination of a large series of these flints, but the opportunities which I have since enjoyed of studying the remarkable collection of the late Mr. Ernest Westlake of Fordingbridge, Hants, have led me to seriously reconsider this question. Mr. Westlake was greatly interested in the early history of mankind, and when searching for eoliths in 1905 was led to visit Puy de Boudieu, which seemed to offer such prospects of success that he at once took up his abode on the spot, and spent six months in excavating its eolith-bearing gravels and extracting the eoliths; using for this purpose the point of a bayonet in preference to a pickaxe, as less likely to injure them. The collection he amassed is amazing and must number some 4000 or 5000 specimens. Mr. Westlake also made a voyage to Tasmania to obtain primitive native implements for comparative study. His collection of these implements is one of the finest in existence.

To make myself better acquainted with the geological structure of the Puy, I studied it in 1922 under the friendly guidance and tutorage of Monsieur P. Marty. It consists at the base of horizontal Oligocene strata which are crowned by a mass of igneous (Andesitic) conglomerate of Upper Miocene to Lower Pliocene age containing isolated masses of Andesitic breccia. Intercalated with this conglomerate is a bed of gravel, Upper Miocene (Pontic) in age, which contains the eoliths (Fig. 38).

The gravel is composed of quartz sand, quartz pebbles

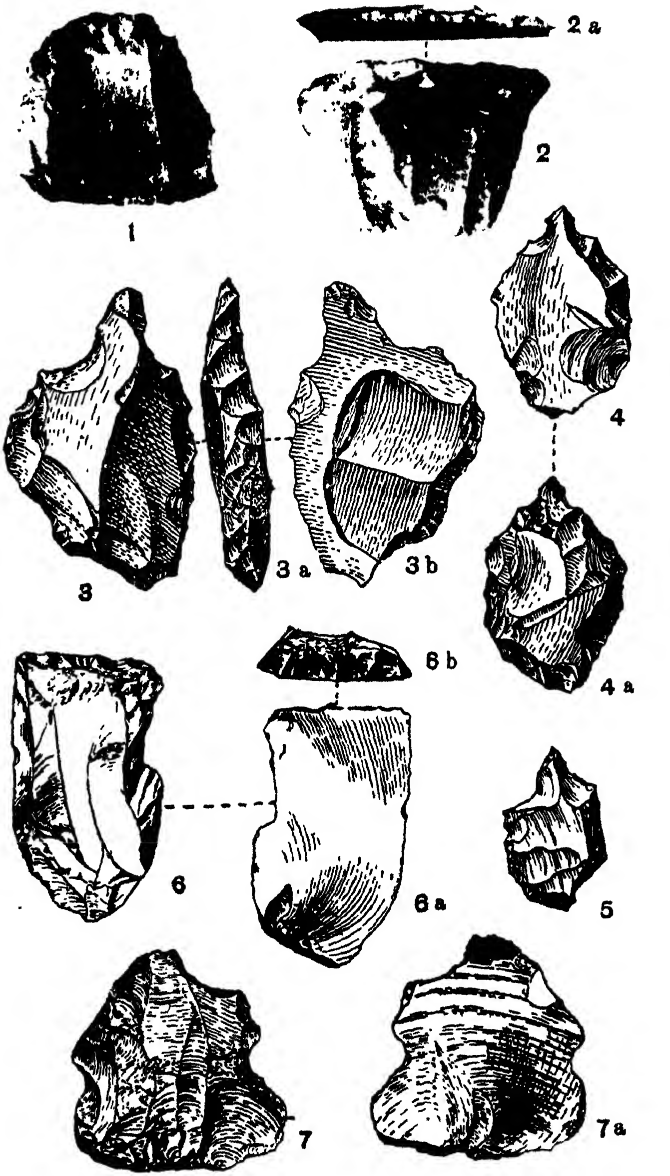


FIG. 39.—Eoliths from the Upper Miocene. 1, 2, from Puy de Boudieu (after Max Verworn); 3, 4, from Puy Courny (after Mayet); 5, a simulacrum of 4, produced by movement of the soil (after Breuil); 6, 7, from Puy de Boudieu, Ernest Westlake Collection. 1, 2 × $\frac{5}{8}$; 3. 4 × $\frac{2}{3}$; 5 × $\frac{4}{5}$; 6, 7, × $\frac{2}{3}$.

and large tabular blocks of flint, intermingled with which are various fragments of flint and the eoliths. A tooth of the three-toed horse, Hipparion, found by Mr. Westlake, confirms the Upper Miocene age, which is attributed to the gravel on other grounds.[1]

The tabular blocks, which vary from less than an inch to as much as four inches in thickness, are fragments of what was originally a continuous bed. They are too large and too obviously unabraded by water action to have travelled far. It is from the edges of these tabular masses that the eoliths have been struck off.

The eoliths present a variety of forms; some are pyramidal, with a flat base and five or six more or less triangular faces which meet above to form the apex. The apex is much bruised by battering, the base has not been struck by blows, for it bears no incipient cones, and from these facts we may plausibly conclude that, if an implement, it was used as a hammer stone.

Others bear a remarkable resemblance to Aurignacian grattoirs; even the grattoir caréné is represented by coarsely flaked examples, as it is also in the Tasmanian industry. The end scraper (Fig. 39, 6) selected for illustration presents a bulbar surface below, *i.e.* a surface of fracture produced by a single blow which is recorded by a bulb of percussion and in this case by an éraillure also; above it is bounded by five long narrow facets running parallel with the length, and the working end has been formed by secondary retouches.

Side scrapers or racloirs occur also as well as scrapers bearing notches of semicircular outline, which might have been used as spokeshaves, there are also flakes

[1] According to German nomenclature the Pontic would be regarded as Lower Pliocene.

worked up to a point which might serve for piercing or boring, and finally elongated slabs of considerable size elaborately flaked at one end into a kind of beak.

In Mr. Westlake's collection the eoliths of Puy Courny and Belbés are also represented; they are strikingly similar to those of Puy de Boudieu, and the Belbés forms have the appearance of being more skilfully flaked, perhaps because they consist of more tractable material.

Evidently the Cantal industry, if it be an industry, is a homogeneous whole. The nearest approach to it seems to be afforded by the Tasmanian implements, the ruder examples of these closely resembling some of the best eoliths of Cantal.

It will be seen from the foregoing that the question whether these eoliths are genuine implements or merely simulacra must be seriously considered.

The natural agencies to which Dr. Mayet attributes them have already been cited. Of these, variations of temperature need not detain us; the effects they produce in no way resemble those we have described: as for torrential action, it might possibly produce by chance blows similar flaking, but if it did the effective blows would be only some out of a greater number which would have left that characteristic mark, the incipient cone. A careful search has failed to reveal any such cones, and therefore the action of torrents cannot be appealed to.

It is otherwise with pressure; the simulative effects of this are truly astonishing, and the thoughtful investigator may well pause before he dismisses this factor as inadequate. The conditions under which the eoliths occur are favourable to the action of pressure,

but, although mingled with quartz sand and quartz pebbles, they do not show the scratches which are so frequently produced by this means. The bulbs of percussion are certainly often very flat, but so they are in many Tasmanian implements and others which are recognised as genuine.

I have myself hesitated for long before arriving at a conclusion, but, in the present state of our knowledge I think the balance of probabilities distinctly points to the conclusion that these eoliths are the work of an intelligent being.[1]

But the question is still open and calls for closer and more minute research.

Pliocene. Ipswich.— We now reach the latest discovery of supposed eoliths. It has excited great and general interest, and is due to Mr. J. Reid Moir, who, in 1910, obtained from the base of the Red Crag (Upper Pliocene) in the neighbourhood of Ipswich numerous flints with boldly flaked surfaces which he attributes to human agency.[2] His conclusions have been supported by Sir E. Ray Lankester,[3] who lays special stress on one particular form of these supposed implements, that which he distinguishes as "rostro-carinate"; it is the "eagle's beak" of Mr. Moir. These beaked specimens (Fig. 40)

[1] On the occasion of my last visit to the Westlake collection I was accompanied by my friends Mr. Reid Moir and Prof. Balfour. After we had been working on it for three days, Mr. Moir expressed the opinion that the eoliths represent a genuine industry and one which closely resembles that of the Red Crag. Prof. Balfour expressed his inability to understand how forms so closely resembling artefacts could have been produced by natural forces.

[2] J. Reid Moir, "The Flint Implements of Sub-Crag Man," *Proc. Prehistoric Soc. East Anglia*, 1911, i, pp. 17–43, 7 pls., and "The Natural Fracture of Flint and its bearing upon Rudimentary Flint Implements," *tom. cit.* pp. 171–184, pls.

[3] Sir E. Ray Lankester, "On the Discovery of a Novel Type of Flint Implements below the base of the Red Crag of Suffolk," *Phil. Trans.* 1912, ser. B, ccii, pp. 283–336, 4 pls.

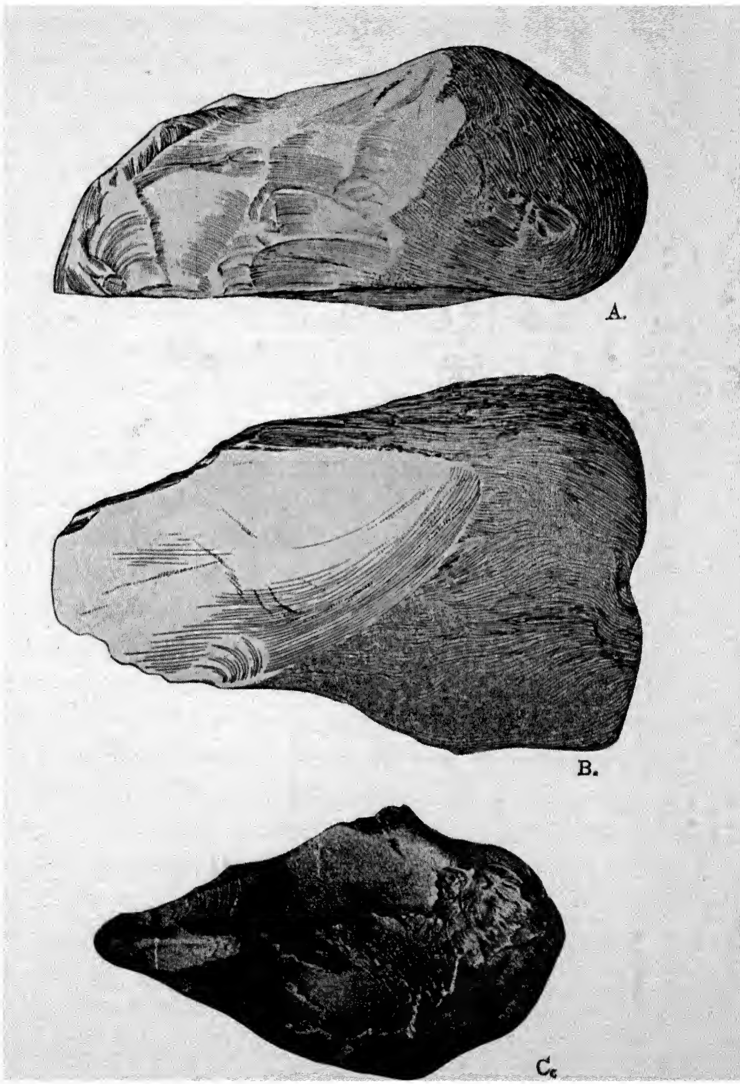


FIG. 40.—Rostro-carinate flints from the base of the Red Crag, Boulton and Loughlin's Pit, Ipswich. A, left lateral surface, and B, ventral surface of the same flint. The dotted lines on B are scratches—probably glacial. (× about 0·6.) C, dorsal surface of another specimen. (× about $\frac{2}{3}$.) (After Sir E. Ray Lankester.)

are large, rudely wedge-shaped fragments, with coarse flaking which is especially marked towards one extremity where the flaked sides meet above to form a sort of keel ending in front in a rude point. In several instances one or more flakes have been detached from the lower surface immediately beneath the beak. The edges and corners of these flints are often excessively bruised and battered.

Notwithstanding the ingenious arguments by which the artefact character of these objects has been sustained their true nature is still open to discussion. Profs. Boule [1] and Breuil, two of the most distinguished investigators in inquiries of this kind, visited Ipswich in 1912 to study the question on the spot, and after examining all the evidence, under the guidance of Sir E. Ray Lankester and Mr. Moir, they were unable to admit that any of the supposed implements found below the Red Crag had been shaped by the hand of man.[1] This was the conclusion to which I was also led after visiting the locality with Mr. Moir, and it has been ably maintained by Mr. Haward [2] and Mr. Sutcliffe.[3]

On the other hand, a Committee [4] of local archæologists has pronounced unanimously in favour of Mr. Moir's views, and Mr. Clarke [5] has described similar flints from beneath the Crag in Norfolk.

The question is of interest, not only to the anthro-

[1] M. Boule, "L'Homme fossile de la Chapelle-aux-Saints," *Ann. de Paléontologie*, Paris, 1911–1913, p. 267. *Ibid.*, "La Paléontologie humaine en Angleterre," *L'Anthr.*, xxvi, 1915.

[2] F. N. Haward, "The Chipping of Flints under Natural Agencies," *Proc. Prehistoric Society of East Anglia*, 1912, i, pp. 185–194, 9 pls.

[3] W. H. Sutcliffe, "A Criticism of some Modern Tendencies in Prehistoric Anthropology," *Mem. and Proc. Manchester Lit. and Phil. Soc.*, 1913, lvii, no. 7.

[4] W. C. Underwood, W. Allen Sturge, W. G. Clarke, Nina F. Layard, and Frank Corner, *Proc. Prehistoric Soc. East Anglia*, 1911, i, pp. 24–39.

[5] W. G. Clarke, "Implements of Sub-Crag Man in Norfolk," *tom. cit.* pp. 160–168, 4 pls.

pologist, but to the geologist as well, for the base of the Red Crag is a peculiar deposit which has been formed under exceptional conditions, not perhaps yet fully understood, and the flints it contains have been acted upon by a variety of natural forces. It is a remanié deposit largely composed of the sweepings of an ancient land surface. The flints, along with other hard bodies, are so firmly embedded in it that a pick is needed to extract them. The history of these flints since they were first liberated from the chalk is long and varied. For an unknown period they lay exposed on the surface of the soil, subject to the influence of rain and weather; at length they were spread out beneath the waters of the Pliocene sea, formed for a time its beach, and were pounded by its breakers; they may even have been exposed to the grinding pressure and heavy blows of coast ice, for ice in some form has left its marks upon them, scoring their surface with deep scratches; they were afterwards covered up with Pliocene deposits and finally subjected to the pressure of the great *mer-de-glace* which over-rode the east of England during the Great Ice Age. They have thus been subject at different times and in various manners to the incidence of many powerful natural forces; if we seek to discover what effects these may have produced, we shall be struck at first glance by the worn and battered edges, which are as characteristic of these flints as they are of many a broken nodule in torrent gravel or sea-shore shingle. This battering, so unsuggestive of intelligence, bears witness to a rain of blows under which fractures would almost certainly be produced, and such fractures we find; they give to the flints a form for which even those who assert their human origin can assign no obvious purpose. Sir E. Ray Lankester has indeed

suggested that they were used as planes, but they cannot be made to plane; they might scarify, but they will not plane.[1]

These general considerations are perhaps sufficient to show the necessity of further inquiry before invoking the intervention of human agency. The problem is extremely difficult, there is room for much difference of opinion, and I look forward to future discoveries, rather than to discussion, for its final solution.

Since the last paragraph appeared in the second edition of this work an important discovery has been made. Mr. Reid Moir, while maintaining his front against all hostile criticism, has neglected no opportunity for research, and his persistent exploration has been rewarded by the discovery in an old coprolite pit at Foxhall Hall (Fig. 41), near Ipswich, of two "floors" in the Red Crag, *i.e.* the remains of two successive terrestrial surfaces bearing evidence of Hominid occupation.[2] The floors, which occur as two layers interstratified with the sands of the Red Crag, are distinguished by the presence of eoliths; phosphate nodules and fossil bones occur along with them.

The eoliths are scattered rather sparingly through these layers, and always at least so far apart from one another that they do not touch. Thus the possibility of flaking by movement under pressure seems to be remote. Further, they show no signs of abrasion, and thus cannot have been shaped by chance blows.

On the other hand, they present all the characters of

[1] For my own part, if these flints should prove to be artefacts, I should be disposed to regard them as pointed weapons. It is the beak which is most suggestive of intentional flaking.

[2] These floors, it will have been observed, lie in the midst of the Red Crag Sands; the eoliths previously described by Reid Moir occur in a compact nodule bed at the base.

FIG. 41.—The western face of the pit at Foxhall Hall, *a* to base, Red Crag; above *a*, glacial gravel. The implement-

intelligent workmanship (Fig. 42). There are cores and the flakes which have been struck off from them. The flakes bear secondary retouches; some appear to have been used as racloirs (side-scrapers), others are pointed as if for boring.

Associated with these pieces are flints marked all over with that superficial crackling which is a sure sign of the action of fire.

Thus it would appear that we have here definite evidence of Hominids who were acquainted with fire and skilful in the art of fabricating flint implements.[1]

Prof. Marr and Mr. Burkitt were so much impressed with the cogency of this evidence that they communicated with Prof. Breuil, who hastened to Ipswich to renew his investigation of the Red Crag flints. The result was a full recognition of the soundness of Mr. Moir's contention, which found expression in the following words: "I believe that there exists at the base of the Red Crag, and also some distance above it, a group of flint flakes, with much family likeness, which in the present state of our knowledge cannot be distinguished from those of human workmanship. They are associated with burnt flints. As a whole I exclude the rostro-carinates; these do not form a homogeneous group, the flaking upon them is not all of the same age, and much of it is to my mind purely accidental."[2]

In 1922 a Commission appointed by the "Institut International d'Anthropologie" to examine into this question visited Ipswich and made a thorough examina-

[1] Some years previously to this discovery Mr. Reid Moir had presented me with a flint eolith from the base of the Red Crag with working which resembled that of some upper Palæolithic implements so closely that I could not definitely pronounce for or against its artefact origin. The discovery at Foxhall relieves me of all doubts. It is a genuine implement. ("A Flaked Flint from the Red Crag," *Proc. Prehist. Soc. of East Anglia*, vol. iii, p. 261, 1920.)

[2] Translated from a letter written 17th Sept., 1920.

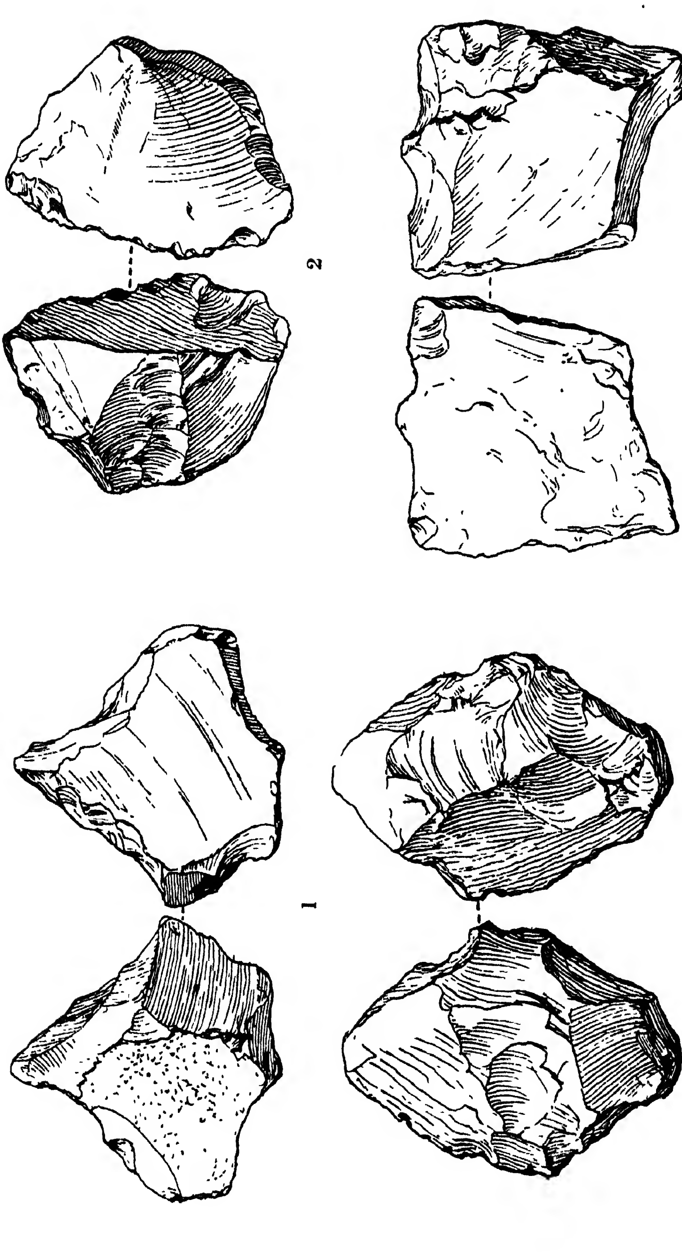


FIG. 42.—Flint implements from Foxhall Hall (16-foot level); 1. borer; 2. racloir; 3. implement worked on both faces; 4. with central spur. (After Reid Moir. Nat. size.)

tion into the facts, under the guidance of Mr. Reid Moir. In a Report drawn up by Profs. Capitan, Fourmarier, Fraipont, Hamel and Lohest they express their agreement with his conclusions [1]; Prof. G. G. MacCurdy of Harvard and Mr. Nelson of New York, who were also on the Commission, arrived at a similar favourable opinion.

The foregoing conclusions, should they be sustained by future inquiry, make us acquainted with the existence in Late Miocene and Middle Pliocene times of an Hominid possessing considerable intelligence, whose hands, preserved or liberated from special functions, were perfected as a universal instrument, while the lower limbs and the foot which had originally possessed the functions of a hand, had become strictly specialised as locomotor organs. Possibly such a being was not far removed from Pithecanthropus.

An objection to regarding eoliths as implements has been based on the asserted constancy in form which they maintain over long periods; but this constancy is by no means so great as is assumed. The Upper Miocene implements, although they share in a family likeness with the Pliocene, are distinguished by special features of their own, as are the Pliocene from the Pleistocene.

Change marks the history of all the industries, and if it proceeds with almost solemn slowness, this is only what we should expect. Those who fully appreciate how rare is the spirit of invention and how deeply rooted the antagonism to change in human nature, even as it now exists, will be prepared to make great allowance for the Hominids, for they stood nearer than ourselves to the lower animals,—the slaves of habit and distinguished by their poverty of invention.

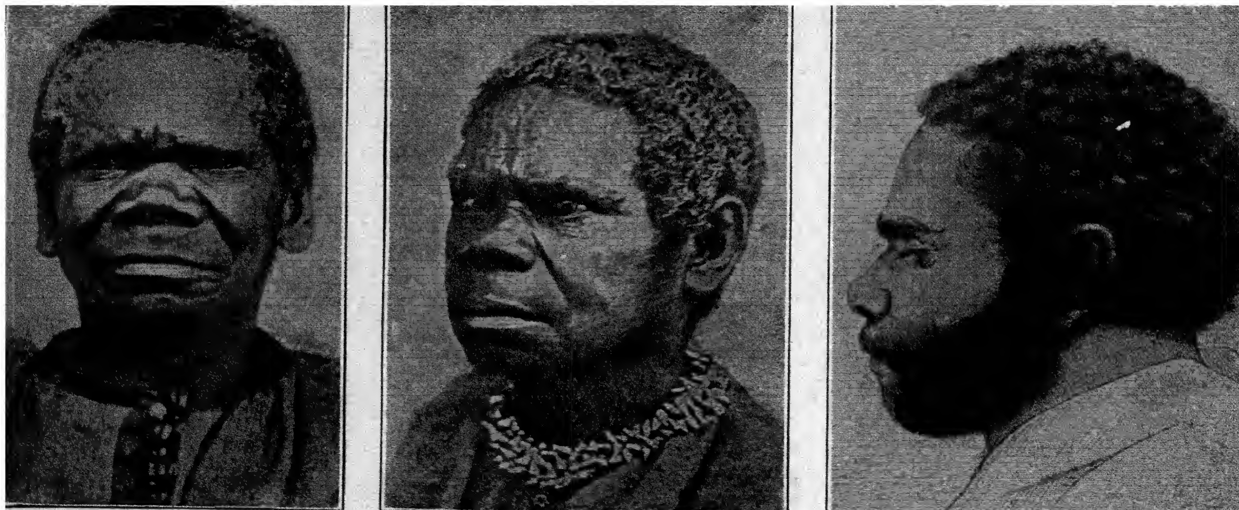
[1] "Les Silex d'Ipswich," *Revue Anthropologique*, tom. xxxiii, 1923, pp. 53–67.

CHAPTER IV

EXTINCT HUNTERS. THE TASMANIANS

To commence a chapter on Pleistocene man by an account of a recent race might well seem a wilful anachronism; the Tasmanians, however, though recent, were at the same time a Palæolithic or even, it has been rashly asserted, an Eolithic race; and they thus afford us an opportunity of interpreting the past by the present—a saving procedure in a subject where fantasy is only too likely to play a leading part. We will therefore first direct our attention to the habits and mode of life of this isolated people, the most unprogressive in the world, which in the middle of the nineteenth century was still living in the Palæolithic epoch.

As regards clothing, the Tasmanians dispensed with it. They habitually went about in a state of nakedness, except in winter, when the skins of kangaroos were sometimes worn. To protect themselves from rain they daubed themselves over with a mixture of grease and ochre. Yet they were not without their refinements; the women adorned themselves with chaplets of flowers or bright berries, and with fillets of wallaby or kangaroo skin, worn sometimes under the knee, sometimes around the wrist or ankle; the men, especially when young, were also careful of their personal appearance—a fully dressed young man wore a necklace of spiral shells and a number of kangaroos' teeth fastened in his woolly hair.



1 2 3

FIG. 43.—Tasmanians from photographs, 1 and 2, of the living, and 3 of the dead subject. No. 3 shows the hair in its natural state. (From Ling Roth.)

They paid great attention to their hair; it was cut a lock at a time with the aid of two stones, one placed underneath as a chopping-block, the other used as a chopper. A sort of pomatum made of fat and ochre was used as a dressing. Tattooing was not practised, but a more barbarous kind of decoration, produced by gashing the arm so as to give rise to cicatrices, was not uncommon.

The Tasmanians had no houses, nor any fixed abode; they wandered perpetually from place to place in search

FIG 44.—Wind screen of the Tasmanians. (After H. Ling Roth).

of food, and their only protection from wind and weather, in a climate sometimes bitingly cold, was a rude screen made by fixing up strips of bark against wooden stakes.[1]

Their implements were few and simple, made of wood or stone; their weapons, whether for the chase or war, were of wood. Of these the spear was the most im-

[1] There is reason to suppose that they sometimes made use of cave shelters. See H. Ling Roth, "Cave Shelters and the Aborigines of Tasmania," *Nature*, 1899, lx, p. 545. Backhouse states that on the west coast they made huts for their winter quarters. The construction of these was simple and ingenious. A circular space was cleared in a thicket of young and slender Ti trees and the tops of the encircling bushes (? trees) were drawn together and thatched with leaves and grass. James Backhouse, *Narrative of a Visit to the Australian Colonies*, 1843, p. 104.

portant; it was fashioned out of the shoots of the "ti" tree, which are distinguished for their straightness. To convert one of these into a spear was an operation demanding considerable skill and care: the stick was first warmed over a fire to render it limber, and if not quite straight was corrected by bending with both hands while held firmly between the teeth. Thus the human jaw was the earliest "arrow-straightener." The end was hardened by charring in the fire, and sharpened by scraping with a notched flake of stone. With a similar implement the bark was removed and the surface rendered round and smooth. When finished it was a formidable weapon; a good spear balanced in the hand as nicely as a fishing-rod; it could be hurled for a distance of sixty yards with sufficient force to pass through the body of a man. The aim of the Tasmanian was good up to forty yards. To keep the spears in good condition, when not in use, they were tied up against the trunk of a tree, selected for its straightness.

The only other weapon was the club or waddy, about two feet in length, notched or roughened at one end to give a grip, and sometimes knobbed at the other; the shaft was scraped smooth in the same manner as the spear. Its range was over forty yards.

The stone implements, which served a variety of purposes, were made by striking off chips from one flake with another; in this occupation a man would sit absorbed for hours at a time. Flint is not known in Tasmania, and a fine-grained sandstone or "phthanite" served as a substitute; it is not so tractable as flint, however, and this may partly account for the inferior finish of much of the Tasmanian workmanship.

A double interest attaches to the notched stone (Fig. 45, 2 and 3) or "spokeshave," used for scraping

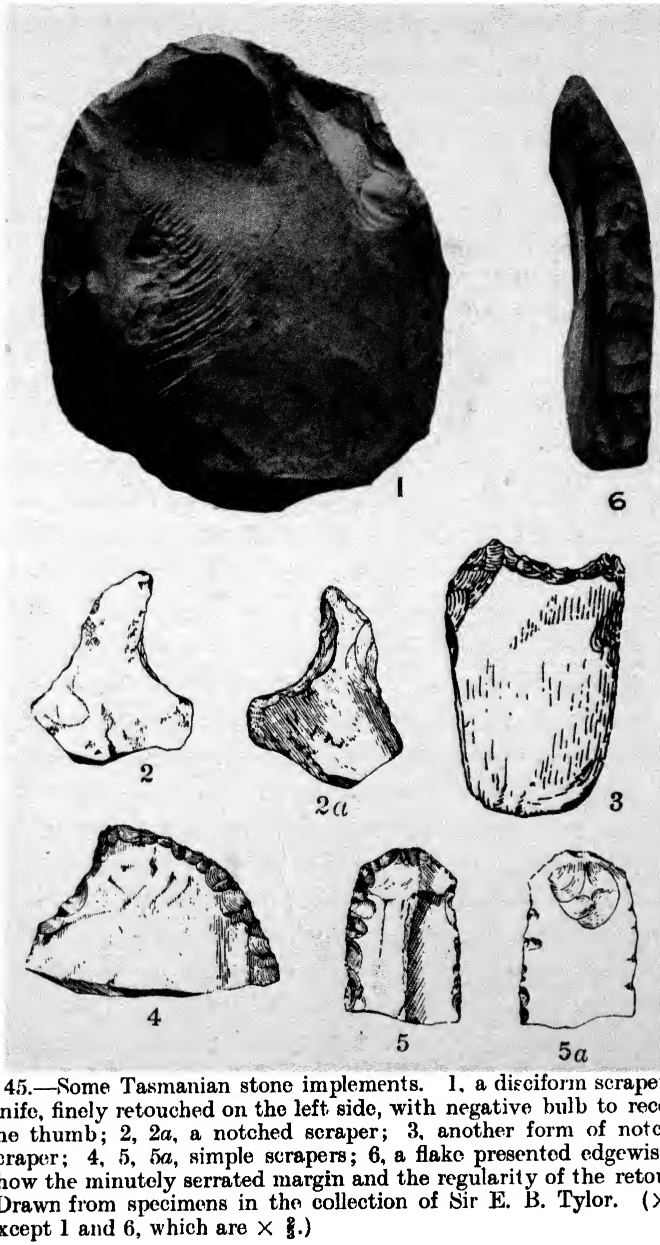


FIG. 45.—Some Tasmanian stone implements. 1, a disciform scraper or knife, finely retouched on the left side, with negative bulb to receive the thumb; 2, 2*a*, a notched scraper; 3, another form of notched scraper; 4, 5, 5*a*, simple scrapers; 6, a flake presented edgewise to show the minutely serrated margin and the regularity of the retouch. (Drawn from specimens in the collection of Sir E. B. Tylor. (× $\frac{1}{2}$, except 1 and 6, which are × $\frac{2}{3}$.)

the spear. The spear itself is perishable, for wood soon decays, and until quite recently no wooden implements were known to have survived the Palæolithic period; but the stone spokeshave, which implies the spear, and in its smaller forms the arrow, may endure for an indefinite time. Many excellent examples of such implements are known under the name of hollow scrapers or "racloirs en coches," both from Palæolithic and Neolithic deposits.

A large, rough tool, delusively similar to the head of an axe, was made by striking off with a single blow a thick flake from a larger block of stone, and dressing the side opposite the surface of fracture by several blows directed more or less parallel to its length. This is not altogether unlike the ancient Palæolithic implement which the French call a "coup de poing" and the Germans a "Beil" (axe) or "Faust Keil" (fist wedge). In English it has no name, though it was at one time inappropriately spoken of as a celt, a term never used now in this sense. Many anthropologists are of opinion that the Palæolithic "coup de poing" was not provided with a haft, but was held directly in the hand; and that it was not used simply as a "chopper": some support for this view is afforded by the fact that the Tasmanians had no notion of hafting[1] their homologue, or rather analogue, of the "coup de poing," and that it served a variety of purposes, among others as an aid in climbing trees. It was the women who were the great climbers: provided with a grass rope, which was looped round the tree and

[1] R. M. Johnston (*Systematic Account of the Geology of Tasmania*, 1888, p. 334) asserts that a heavy stone used as a tomahawk was provided with a handle: "being fastened to it in the same way as a blacksmith fastens a rod to a chisel, and afterwards well secured by the sinews of some animal." This is denied by those best acquainted with the Tasmanians.

held firmly in the left hand, they would cut a notch with the chipped stone[1] and hitch the great toe into it; then adjusting the rope they would cut another notch as high, it is said, as they could reach; again hitch themselves up, and so on till they attained the requisite height—sometimes as much as 200 feet. In this way they pursued the "opossum" up the smooth trunk of the gum-tree. Many stories are told of their expertness: on one occasion a party of lively girls chased by sailors made a sudden and mysterious disappearance; on looking round a number of laughing faces were descried among the branches of the trees, into which the girls had swarmed in the twinkling of an eye.

There is great inconvenience in having no special name for the "coup de poing"—greater perhaps than attaches to the introduction of a new word; I propose therefore to call it a "boucher," thus honouring the memory of Boucher de Perthes, who was the first to compel the attention of the scientific world to these relics of the past. This kind of nomenclature has already been introduced by physicists, as, for instance, in the terms volt, joule, watt, and others. Its great recommendation lies in its complete independence of all hypothesis.[2]

[1] Sir Edward Tylor describes this as a quoit-like stone, 4 to 6 in. across, and chipped about two-thirds round the edge: *Journ. Anthr. Inst.*, 1893, xxiii, p. 142.

[2] The name "hand-axe," which has been suggested, is a question-begging term, involving two assumptions, each of which is open to discussion. Boucher de Perthes thought that some were hafted and some not. (B. de Perthes, *Antiquités celtiques et antédiluviennes*, ii, 1857, p. 171; iii, 1864, p. 74.) G. de Mortillet (*Le Préhistorique*, 1885, p. 142), that none were hafted, and D'Acy (*Bull. Soc. d'Anthr.*, 1887) that all were hafted. There is much to be said for D'Acy's view, and respect for the opinion of those that agree with him leads me to think that an indifferent name has its advantages. M. Commont does not admit that these implements, "dénommé improprement coup de poing," were axes at all, whether hafted or not.

Another implement was an anvil, formed of a plate of stone chipped all round into a circle, about 7 in. in diameter, 1·5 in. thick in the middle, and 1 in. thick at the edge. On this the women broke the bones left after a meal to extract the marrow, using another stone, about 6 in. in diameter, as a hammer. M. Rutot has described several such anvils (*enclumes*), but of a ruder make, from early Palæolithic deposits.

One of the commonest tools was the scraper, a flake of about 2 in. in diameter, carefully dressed by chipping on one side only to a somewhat blunt edge (Fig. 45, 4 and 5). The edge was not serrated, and great skill was required to keep the line of flaking even: it was used for flaying animals caught in the chase, and as well, no doubt, for other purposes. To test its powers Sir Edward Tylor sent a specimen to the slaughter house requesting the butcher to try his skill in flaying with it. The notion was rather scornfully received, but on trial the flake was found to be admirably adapted to the task, removing the skin without damaging it by accidental cuts.

The country seems to have afforded the Tasmanians a fair amount of game. Kangaroos, wallaby, opossums, bandicoots, the kangaroo rat, and the wombat were all excellent eating, especially as cooked by the natives. The animals were roasted whole in the skin and cut up with stone knives; the ashes of the wood fire were sometimes used as a seasoning in default of salt. Cooking by boiling was unknown to this primitive people, and when introduced by us they expressed their disapproval of it as an inferior method.

They hunted several kinds of birds, such as the emu, now extinct in Tasmania, black swans, mutton birds, and penguins. The eggs of birds were collected by the

women and children. Snakes and lizards were put under contribution, as well as grubs extracted from hollow trees, and said by Europeans to be dainty morsels, with a nutty flavour reminiscent of almonds.

Fish the Tasmanians did not eat, simply because they were ignorant of the art of fishing, nets and fish-hooks being unknown to them; but cray-fish and shell-fish were an important article of diet. The women obtained the shell-fish by diving, using a wooden chisel, made smooth by scraping with a shell, to displace those, such as the limpets, which live adherent to the rocks.

The shell-fish were roasted; and the empty shells, thrown away near the hearths, grew into enormous mounds or kitchen middens, which still afford interesting material to the anthropologist. Most of the shells found in them belong to genera which are universally eaten by mankind, such as oysters, mussels, cockles, limpets, periwinkles (Turbo and Purpura), and ear-shells (Haliotis). The periwinkles were broken by a stone hammer on a stone anvil, and these implements, as well as stone knives, are also found in the kitchen middens.

Several kinds of plants furnished the natives with vegetable food—the young roots of ferns, roots of bulrush, the ripe fruit of the kangaroo apple (*Solanum laciniatum*), a fungus with a truffle-like growth, and sea-wrack. These were cooked by broiling.

Water was their usual but not their only drink, for they well understood the virtues of fermented liquor. A species of gum-tree (*Eucalyptus resinifera*) yields when tapped a slightly sweet juice, resembling treacle; this they allowed to collect in a hole at the bottom of the trunk, where it underwent a natural fermentation and furnished a kind of coarse wine.

Fire was obtained either by the simple plan of rubbing

the pointed end of a stick to and fro in a groove cut in another piece of wood, or by the drill method, *i.e.* by rotating one stick in a hole sunk in another.[1] Each family kindled its own fire at its own hearth, the hearths being separated by intervals of fourteen to twenty yards.

The following statement of Backhouse [2] is of interest in connection with the discovery of marked stones in some European caves. He writes: "One day we noticed a woman arranging stones; they were flat, oval, about two inches wide, and marked in various directions with black and red lines. These we learned represent absent friends ('plenty long way off'), and one larger than the rest a corpulent woman on Flinders Island, known as Mother Brown." This description recalls the painted stones found by E. Piette [3] in the cave of Mas d'Azil, Ariège, on an horizon (Azilian) which marks the conclusion of the Palæolithic age. These also are "flat, oval, and about two inches wide," and "they are marked in various directions with red and black lines," or other bands (Fig. 46), but on not a few of them more complex characters occur which in a few instances simulate some of the capital letters of the Roman alphabet. The resemblance is indeed so startling that, on the one hand, doubts, certainly ill-founded, have been expressed of their genuineness, and on the other, theories have been propounded attributing to them some connexion with the Phœnician script. There can be no doubt as to their genuineness. M.

[1] That the Tasmanians were acquainted with the fire-drill is open to doubt.—H. Ling Roth, "Tasmanian Firesticks," *Nature*, 1899, lix, p. 606, and *The Aborigines of Tasmania*, Halifax, 1899.

[2] James Backhouse, *op. cit.*, p. 104.

[3] E. Piette, "Les Galets coloriés du Mas d'Azil," *L'Anthr.*, 1895, vi, p. 276, and 1897, vii, p. 385.

Cartailhac [1] has confirmed the original observations of Piette, and M. Boule has found additional examples in another locality (see also p. 615); but their meaning remains obscure. M. Hoernes remarks that they offer one of the darkest problems of prehistoric times. I am tempted to think that some light is thrown on this problem by the Tasmanian stones,[2] but here we have to lament one of our many lost opportunities; the Tasmanians have disappeared, and these stones with them; not a single specimen, not even a drawing, is preserved in any of our museums.

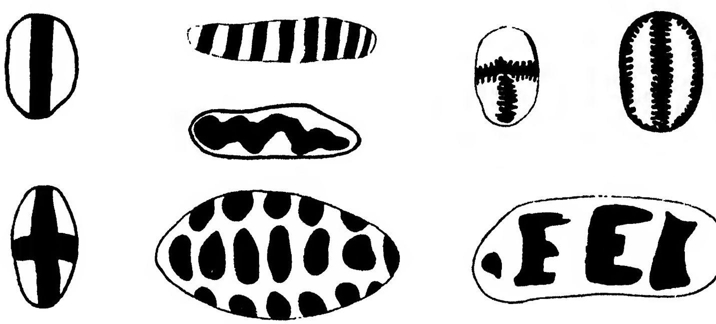


Fig. 46.—Painted stones from Mas d'Azil.

It is said that rude attempts were sometimes made to represent natural objects by drawings. Very poor sketches of cattle, kangaroo, and dogs done in charcoal are mentioned; but cattle and dogs suggest the possibility of European influence. The fact that large

[1] E. Cartailhac, *L'Anthr.*, 1891, ii, p. 147.

[2] "Palæolithic Races," *Science Progress*, 1909, p. 504. M. Salomon Reinach has since made a similar suggestion, *L'Anthr.*, 1909, xx, p. 605. Mr. A. B. Cook has compared the painted pebbles of Mas d'Azil with the Australian "churinga," *L'Anthr.*, 1905, xiv, 655, and Prof. F. Sarasin has expressed his approval of this view, "Des Galets coloriés de la Grotte de Birseck près Bâle," C. R. de la XIV^e Session, *Congrès International d'Anthropologie*, Geneva, 1912, p. 569. The Tasmanian stones may also have been "churinga," but this is very doubtful and difficult to reconcile with the fact that in Australia such objects are "taboo" to the women.

pieces of bark have been found with rudely marked characters like the gashes the natives cut in their arms is of more importance. These are not unlike some of the marks incised on Palæolithic implements.

The Tasmanians are said to have been unacquainted with boats or canoes, but they possessed a useful substitute, half-float, half-boat, which recalls in a striking manner the "balsa" of California or the rafts made of papyrus or of the leaf stalks of the ambatch tree, which are still to be met with on the Nile and Lake Nyanza.

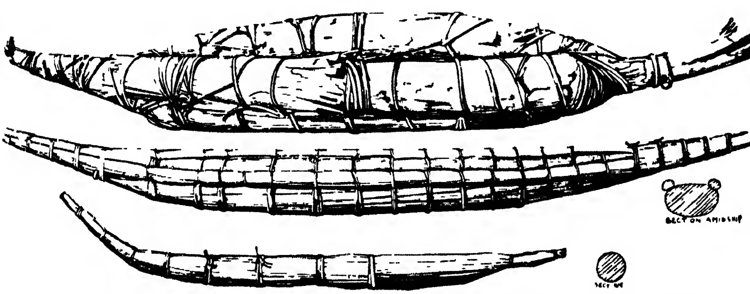


Fig. 47.—Tasmanian "raft." (Drawn by H. Ling Roth, from examples in the Pitt Rivers Museum, Oxford. $\times$ about $\frac{1}{36}$.)

Similar rafts are said to have been used by some Melanesian islanders.

The Tasmanian raft (Fig. 47) was made of the bark of more than one kind of tree, but usually it would seem some species of Eucalyptus. The bark having been removed was rolled up into something like a colossal cigar, pointed at each end. Three such rolls were required, a larger one to form the bottom and two smaller ones to form the sides of the raft. They were firmly lashed together, side by side; a tough coarse grass serving for cord. The completed raft was not unlike in general form a shallow boat, being broadest in the middle and tapering away to a pointed extremity at each end. It was of considerable size, attaining

sometimes a length of between 9 and 10 ft., with a breadth of about 3 ft., a height of 1¼ ft., and a depth inside of 8 to 9 ins. It would carry comfortably three or four persons, and at a pinch as many as five or six. In shallow water it was punted with poles, and the same poles, devoid of any blade-like expansion at the end, were used as paddles on the open sea. Nevertheless the Tasmanians were able to make their rafts travel at a fair pace through the water—"as fast as an ordinary English whale-boat"; it must have been hard work, and they seem to have thought so; "after every stroke they uttered a deep 'ugh' like a London paviour." A fire, carried on a hearth of earth or ashes, was kept burning at one end of the raft.

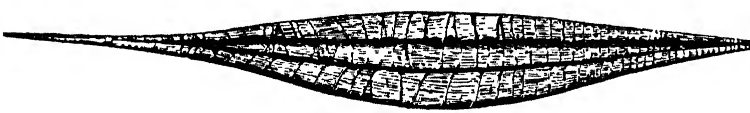


FIG. 48.—Raft or "balsa" of Seri Indians. (After McGee.)

How far the Tasmanians ventured out to sea in these frail craft is unknown; they certainly visited Maatsuyker island, "which lies three miles from the mainland in the stormy waters of the South Sea," and they were observed to make frequent crossings to Maria Island off the east coast during calm weather. The rafts have been known to live in very rough seas, and an old whaler asserted that he had seen one of them go across to Witch Island, near Port Davey, in the midst of a storm. The natives on the north coast of Tasmania are said not to have made use of rafts.[1]

The "balsa" of the Seri Indians (Fig. 48) in Sonora (California) closely resembles the Tasmanian raft, differing mainly in the substitution of bundles of reeds for

[1] H. Ling Roth, *The Aborigines of Tasmania*, Halifax, England, 1899.

rolls of bark; but it attained a much greater size, being sometimes as much as 30 ft. in length.[1] With only one passenger aboard it rose too high out of the water, "rode better with two, carried three without difficulty, even in a fairly heavy sea, and would safely bear four adults . . . in moderate water." European observers who have seen this craft afloat have admired "its graceful movements and its perfect adaptation to variable seas and loads," curving "to fit the weight . . . and to meet the impact of swells and breakers."

The Seri Indians are in the habit of crossing in their balsas from the mainland to the outlying island, and occasionally even complete the passage across the gulf to the opposite shore of Lower California.[2]

The facts we have thus briefly summarised include almost all that I can discover bearing directly on our subject. For the sake of completeness it may be as well to give some account of the bodily characters of this interesting people, and a few words as to their history.

The Tasmanians were of medium stature, the average height of the men being 1661 mm., with a range of from 1584 to 1732 mm.; the average height of the women was 1503 mm., with a range of from 1295 to 1630 mm. The colour of the skin was almost black, inclining to brown. The eyes were small and deep-set beneath strong overhanging brows; the nose short and broad, with widely distended nostrils; the mouth big; and the teeth large; disproportionately large indeed for the size of the jaw.

The hair was black and grew in close corkscrew ringlets. The men had hair on their faces—whiskers,

[1] A similar craft, but provided with sails, is used in Peru. Mr. H. Balfour informs me that balsas are used all along the West Coast of America.

[2] W. J. McGee, *The Seri Indians*, *op. cit.*, pp. 215–221.

moustache, and beard—and on the borders of the whiskers it assumed the form of tufted pellets like peppercorns (Fig. 43, 3).

It is a commonplace amongst biologists that characters of apparently the most trivial significance are precisely those which are of the greatest value as a means to classification, and it is on the degree of curliness or twist in the hair that the most fundamental subdivision of the human race is based. We thus recognise three groups: one in which the hair is without any twist—that is, perfectly straight—the Lissotrichi; another in which it is twisted to an extreme, as in the Negro or Bushman—the Ulotrichi; and a third in which the hair is only twisted enough to be wavy, as in many Europeans—the Cymotrichi. The Tasmanian is ulotrichous, like the Negro and most other races with very dark skins.

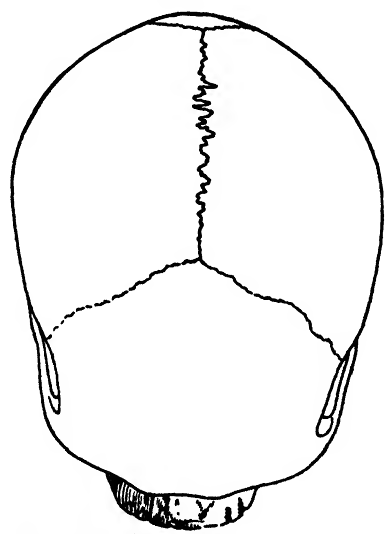


FIG. 49.—Tasmanian skull, seen from above. (After H. Ling Roth. × about 1/3.)

The bony framework, being more resistant to decay than the rest of the body, is more likely to be preserved in the fossil state, and has therefore a certain amount of importance in our study. We shall restrict our description, however, to the skull, as more is to be learnt from this than from any other portion of the skeleton.

The skull of the Tasmanian is of a characteristic form, so that a practised eye can readily distinguish it from that of other races. Looked upon directly from

above (Fig. 49) its outline is oval or more or less pentagonal; its greatest breadth lies considerably behind the middle line. The crown rises into a low keel, bordered by a groove-like depression on each side; the sides of the skull are wall-like, but swell out into large parietal bosses (Fig. 50).

It is long (dolichocephalic), and the ratio of its breadth to its length (cephalic index) is 74·9, as determined from measurement of eighty-six examples.[1] Its height is about 5 mm. less than its breadth; the Tasmanians may therefore be called flat-headed (platycephalic). The cranial capacity is the lowest yet met with among recent races, measuring on the average 1199 c.c., or, in round numbers, 1200 c.c.; in the men the average rises to 1306 c.c., in the women it falls to 1093 c.c.[2]

The face is remarkably short (Fig. 50), and presents a peculiarly brutal appearance; the brow-ridges and glabella are strongly marked, and there is a deep notch at the root of the nose. The jaws project, but not to the extreme degree which is characteristic of the Negro, nor even so much as in some Australians. The lower jaw is small, disproportionately so when compared with the teeth, which, as already observed, are comparatively large. In consequence of this misfit the natives suffered grievously from abnormalities of dentition.

In endeavouring to discover the people to whom the Tasmanians were most closely related, we shall naturally

[1] R. J. A. Berry, A. W. D. Robertson, and K. S. Cross, "A Biometrical Study of the Tasmanian, Australian and Papuan," *Proc. Roy. Soc. Edin.*, 1910, xxxi, pp. 30, 31. The mean length obtained is $180·30 \pm 0·51$, and the mean breadth $135·14 \pm 0·35$ mm.

[2] In computing these numbers I made use of all the observations accessible up to 1910. Sir W. Turner obtains a mean capacity of between 1200 and 1300 c.c. for Tasmanian men. "The Aborigines of Tasmania," Pt. 2, *Trans. Roy. Soc. Edin.*, 1910, xlvii, p. 451.

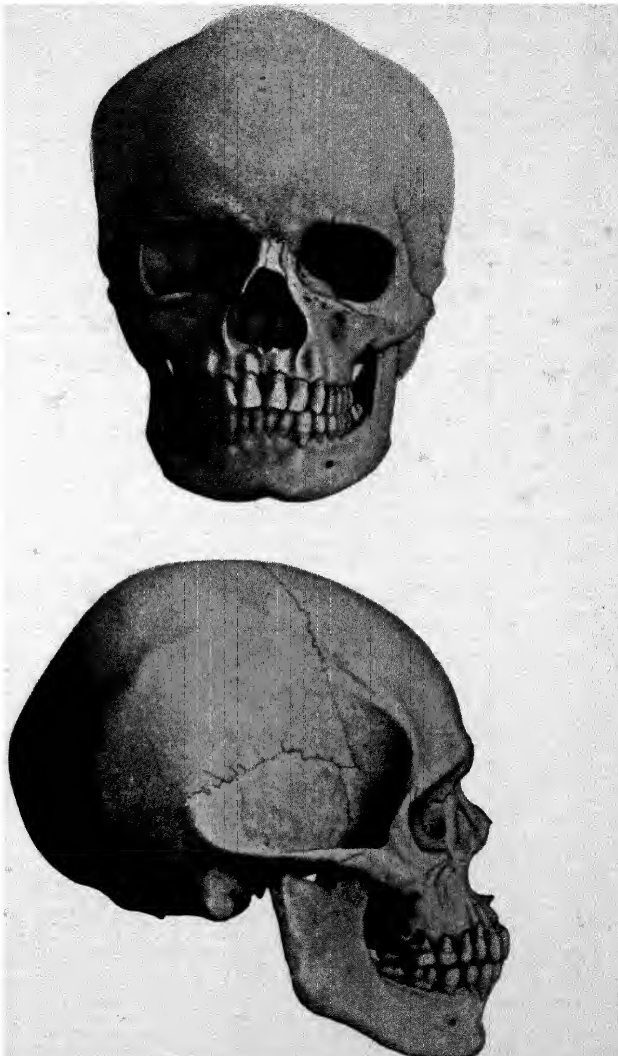


FIG. 50.—Tasmanian skull full face and in profile.
(After H. Ling Roth. × about $\frac{1}{3}$.)

restrict our inquiries to the Ulotrichi, for, as we have seen, the Tasmanians belonged to this group. Huxley

thought they showed some resemblance to the inhabitants of New Caledonia and the Andaman Islands, but Flower was disposed to bring them into closer connexion with the Papuans or Melanesians. The leading anthropologists in France do not accept either of these views.

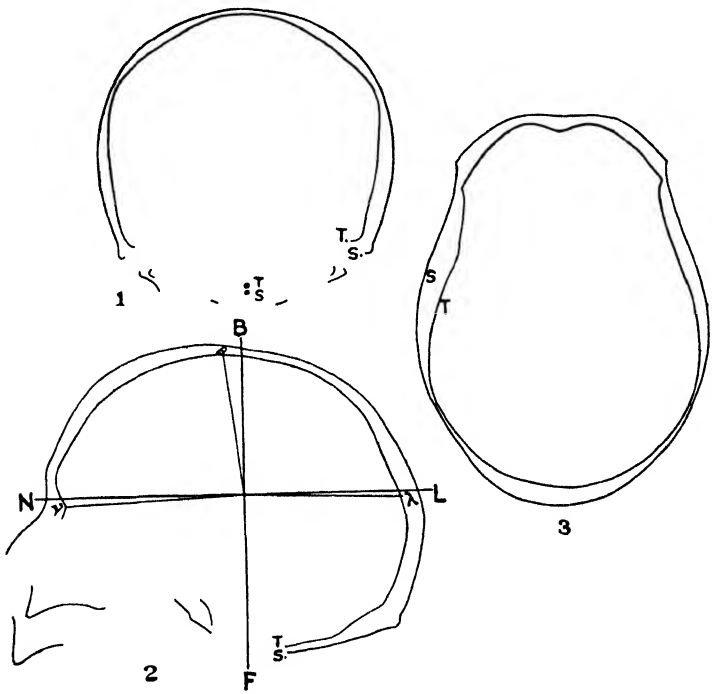


FIG. 51.—Skull of a Tasmanian (T) compared with that of a Swede (S): 1, Vertical transverse sections through the occipital condyles and auditory meatus; 2, Horizontal sections; 3, Sagittal sections.

Topinard states that there is no close alliance between the New Caledonians and the Tasmanians, while Quatrefages and Hamy remark that "from whatever point of view we look at it, the Tasmanian race presents special characters, so that it is quite impossible to discover any well-defined affinities with any other existing

race," and this probably represents the prevailing opinion of the present day.[1]

The Tasmanians appear to have been an autochthonous people, native to the soil, the surviving descendants of a primitive race, elsewhere extinct or merged into a preponderant alien population. Frequenting the coast, and yet destitute of sea-going craft capable of making long voyages, it is scarcely likely that they reached Tasmania from any of the remote Pacific islands; and it is far more probable, as our foremost authorities now maintain, that they crossed over from Australia.

The primitive ancestors of the race may have been widely distributed over the Old World: displaced almost everywhere by superior races, they at length became confined to Australia and Tasmania, and from Australia they were finally driven and partly perhaps absorbed or exterminated by the existing aborigines of that continent, who were prevented from following them into Tasmania, because by that time Bass Strait was wide enough to offer an insuperable barrier to their advance.

A notion exists that the natives entered Australia and Tasmania by dry land, at a time antecedent to the formation of Torres Strait and Bass Strait, but the well-known distinction between the Australian and Oriental faunas presents some difficulty to this view. It would

[1] Sir Wm. Turner, "The Aborigines of Tasmania," *Trans. Roy. Soc. Edin.*, 1908, xlvi, pt. 2, p. 365, in particular pp. 385–394; 1910, xlvii, pt. 3, p. 411. See also R. J. A. Berry, A. W. D. Robertson, K. S. Cross, "A Biometrical Study of the Relative Degree of Purity of Race of the Tasmanian, Australian and Papuan," *Proc. Roy. Soc. Edin.*, 1910, xxxi, pp. 17–40. R. J. A. Berry and A. W. D. Robertson, "The Place in Nature of the Tasmanian Aborigine," *op. cit.*, pp. 41–69; and H. Basedow, "Der Tasmanier Schadel ein Insulartypus," *Zeits. f. Ethn.*, 1910, xlii, pp. 175–227. A different view is held by H. von Luschan, "Zur Stellung der Tasmanier, ein anthropologisches System," *Zeits. f. Ethn.*, 1910, xlii, p. 287.

appear that man must have possessed some special means by which he could enter Australia unaccompanied by other animals. The rafts of the Tasmanians thus acquire an unexpected importance; they were capable, as we have seen, of making voyages across channels at least three miles in width. It is true that much wider channels than this now break up the road from New Guinea to Tasmania; but there seems to have been a time, probably geologically recent, when these channels did not exist and the Australian cordillera stretched as a continuous mountain chain from the one great island to the other. It was only by repeated subsidence that it became broken down, in the region of Torres Strait on the north and Bass Strait on the South. Subsidence has also probably enlarged the seas between the islands of the East Indies. Thus at some past epoch the channels which afterwards confined the Australians and the Tasmanians to their respective lands may have been sufficiently narrow to have been crossed by rafts and yet wide enough to have barred the way to the rest of the Oriental fauna.

When the more civilised nations of the north had succeeded in subjugating the sea to their enterprise, even the ocean itself failed in its protection to the unfortunate Tasmanians, and with the arrival of English colonists their doom was sealed. Only in rare instances can a race of hunters contrive to co-exist with an agricultural people. When the hunting ground of a tribe is restricted owing to its partial occupation by the new arrivals, the tribe affected is compelled to infringe on the boundaries of its neighbours: this is to break the most sacred "law of the Jungle," and inevitably leads to war: the pressure on one boundary is propagated to the next, the ancient state of equilibrium

is profoundly disturbed, and inter-tribal feuds become increasingly frequent. A bitter feeling is naturally aroused against the original offenders, the alien colonists: misunderstandings of all kinds inevitably arise, leading too often to bloodshed, and ending in a general conflict between natives and colonists, in which the former, already weakened by disagreements among themselves, must soon succumb. So it was in Tasmania.

The estimates which have been given of the number of the population at the time Europeans first became acquainted with the country differ widely: the highest is 20,000, but this is probably far in excess of the truth. After the war of 1825 to 1831 there remained scarcely 200. These wretched survivors were gathered together into a settlement, and from 1834 onwards every effort was made for their welfare, but "the white man's civilisation proved scarcely less fatal than the white man's bullet," and in 1877, with the death of Truganini, the last survivor, the race became extinct.

It is a sad story, and we can only hope that the replacement of a people with a cranial capacity of only about 1200 c.c. by one with a capacity nearly one-third greater may prove ultimately of advantage in the evolution of mankind.

The world certainly needs all the brains it can get: at the same time it is not very flattering to our own powers of intelligence to find that we allowed this supremely interesting people, the last representatives of one of the earliest stages of human culture, to perish, without having made any serious effort to ascertain all that could be known about it. What we do know is very little indeed: a book of about three hundred pages contains almost every scrap of trustworthy information.[1]

[1] H. Ling Roth, *The Aborigines of Tasmania*, Halifax, England, 1899.

If any other nation than our own had shown the same disregard for a human document of such priceless value, we should be very outspoken in our censure. Even now, in this twentieth century, it cannot be said that the British Government takes such an intelligent interest in the numerous primitive peoples which it has taken into its charge as we have a right to expect, at least from a State having any regard for the advancement of learning.

The first to call attention to the resemblance between the stone implements of the Tasmanians and those of Palæolithic man was Sir Edward Tylor.[1] Subsequently Mr. R. M. Johnston [2] compared them with the "eoliths" figured by Ribiero already alluded to. Sir Edward Tylor [3] has repeatedly returned to the subject; and in 1905 when he exhibited specimens before the Archæological Institute, he made the following statement: "I am now able to select and exhibit to the Institute from among the flint implements and flakes from the cave of Le Moustier, in Dordogne, specimens corresponding in make with such curious exactness to those of the Tasmanian natives, that were it not for the different stone they are chipped from, it would be hardly possible to distinguish them." [4]

Subsequently Sir Edward Tylor was led to believe that an even closer resemblance could be traced between the so-called plateau implements and the Tasmanian.

[1] E. B. Tylor, *The Early History of Mankind*, London, 1865, p. 195.

[2] R. M. Johnston, *Systematic Account of the Geology of Tasmania*, 1888, p. 334.

[3] E. B. Tylor in Preface to H. Ling Roth, *The Aborigines of Tasmania*, 1st Edition, 1890; 2nd Edition, 1899. "On the Tasmanians as Representatives of Palæolithic Man," *Journ. Anthr. Inst.*, 1893, xxiii, pp. 141–152, 2 pls. "On the Survival of Palæolithic Conditions in Australia and Tasmania," *Journ. Anthr. Inst.*, 1898, xxviii, p. 199. "On Stone Implements from Tasmania," *Journ. Anthr. Inst.*, 1900, xxx, p. 257.

[4] *Journ. Anthr. Inst.*, 1895, xxiv, p. 336.

A similar view has also commended itself to M. Rutot and Dr. H. Klaatsch.[1] If this could be established it would invest the Tasmanian implements with peculiar interest.

The plateau "implements" are so called because they are found in gravels capping the high plateaux of Kent and elsewhere. They were first discovered by Mr. B. Harrison, of Ightham, who brought them before the notice of Sir Joseph Prestwich; and this observer, famous for the caution and sagacity of his judgement, expressed in unqualified terms his conviction that they showed signs of the handiwork of man.[2] Sir John Evans, a fellow-worker with Prestwich, and equally distinguished for his acumen and insight, was unable, however, to share this opinion, and the question is still involved in controversy.

The plateau gravels are no doubt very ancient. Prestwich spoke of them as glacial or pre-glacial; M. Rutot assigns them to the Pliocene.

The problem presented by the supposed implements is no doubt a difficult one. Some of the Tasmanian forms are so rude and uncouth that, taken alone, we might have little reason to suspect that they had been chipped by man; a great number, on the other hand, show signs of very skilful working, and leave us in no doubt. It is on these last that our judgement should be based in a study of the Tasmanian art. As to the rest, "*noscitur a sociis.*" They are distinguished by two very definite characters. In the first place their fundamental

[1] A. Rutot, "La Fin de la Question des Éolithes," *Bull. Soc. Géol. Belg.*, 1907, xxi, p. 211; H. Klaatsch, *Zeits. f. Ethnologie*, 1907.

[2] J. Prestwich, *Quart. Journ. Geol. Soc.*, 1889, xlv, pp. 270–294, pls.; 1890, xlvi, p. 166, 1891, xlvii, pp. 126–160, pls.; *Journ. Anthr. Inst.*, 1889, xxi, pp. 246–270, pl.; see also W. J. Lewis Abbott, *Nat. Sci.*, 1894, iv, pp. 256–266, and T. Rupert Jones, *Nat. Sci.*, 1894, v, pp. 269–275.

form is that of a flake which has been split off from a larger fragment. They never commence their existence as fragments already existing in a natural state. And next, the finer dressing of the stone is always confined to one face; if a boucher, there is one face obtained by a single blow which detached it from the parent mass, and an opposite face with secondary flaking; if a scraper, the marginal dressing is produced by the removal of chips always struck off in the same direction, and in a manner not greatly differing from that of characteristic Mousterian scrapers.

If we judge the Tasmanian implements by the best examples, we should in fairness extend the same treatment to the plateau "implements." Some of the best of these show some superficial resemblance to the Tasmanian, but only in general form: this is particularly true of the hollow scrapers. In connexion with these we may cite the following statement made by Prestwich when speaking of the plateau implements. He says: "A very common form is a scraper in the shape of a crook, sometimes single, sometimes double, such as might have been used *for scraping round surfaces like bones or sticks.*" The part we have placed in italics shows remarkable insight, but unfortunately these supposed scrapers will not scrape and, if artefacts, had presumably some other function.

Again, the comparison is scarcely sustained when we enter into a minute investigation. To begin with, the fundamental form of the plateau "implement" is rarely—so far as I know, never—artificial. On the hypothesis that these fragments were used by man, we must suppose that, to begin with, he simply selected such bits of flints, lying scattered about, as he thought would serve his ends, and then merely improved their

existing edges by additional chipping. This supposed chipping, though often confined to one side of the fragment, has not the closeness or regularity that distinguishes Tasmanian scrapers. The confused and clumsy chipping of the plateau "hollow-scraper" does not produce an efficient edge, and it seems hard to believe that a being with sufficient intelligence to conceive the idea of a spokeshave should not have succeeded in making a better one.[1]

Mr. Henry Balfour, one of the first to study Tasmanian implements and to recognise their Palæolithic affinities, regards them as representing a separate industry. While agreeing with Mr. Balfour on the existence of special features characteristic of the Tasmanian implements—possibly due to the peculiar character of the stone[2] from which they were made—I am still inclined to think that Sir Edward Tylor made a closer approach to the truth in his earlier than in his later comparisons. Some resemblance to Mousterian implements may indeed be recognised, but scarcely any to the problematical flints of the Kent plateau. This is also the opinion of Professor Paul Sarasin[3] and of the Abbé Breuil, who considers that the Tasmanian implements find their closest alliance with the quartzite implements of Mousterian age which occur in the north of Spain.

The Tasmanians may therefore be regarded with great probability as representing an ancient race, which, cut off from free communication with the surrounding world,

[1] Through the kindness of Mr. Harrison I have now examined a large number of his best specimens: several of them have a remarkably artificial look and may possibly have been shaped by man.

[2] It has a marked tendency to split in one direction.

[3] P. Sarasin, *Vh. d. Nf. Ges. Basel*, Bd. xxiii, and *Zeits. fur Ethn.*, Bd. xl, 1908, p. 428.

had preserved almost unchanged the habits and industrial arts which existed in Europe during the later days of the Lower Monastirian age.

Though in its bodily characters this race differed considerably from the Mousterian Europeans—they are of different species—yet it retained so much that is primitive and was at the same time so pure or homogeneous that we may fairly include it among those interesting relics known to biologists as surviving archaic types. Our knowledge of the Tasmanians is but small, yet the little we possess is of fundamental importance, providing analogies for our guidance in the study which now awaits us of Palæolithic man.

CHAPTER V

LOWER PALÆOLITHIC—CHELLEAN AND ACHEULEAN AGES

IF, suddenly transported to the middle of the Palæolithic epoch, we could survey the face of the earth as it then appeared, we might be surprised at first by its strange and unfamiliar aspect; but on closer inspection, as we traced one by one its leading features and identified the several continents and seas, we should perceive that the general plan remained the same and that the details alone were changed.

FIG. 52.—The Pleistocene geography of Europe during a period of elevation.

These details, however, were neither few nor unimportant. The whole continent of Europe had enlarged its bounds, and the Atlantic broke against a shore lying far to the west of the British Isles, along a line where soundings now show a depth of 100 fathoms. It looks as though the ocean had sunk 600 feet. The Irish Sea, the English Channel, and the German Ocean, thus deserted, formed wide valley plains, watered by many noble rivers (Fig. 52). The Rhine with its

tributaries the Elbe and the Thames, swept in wide meanders to the north till it opened into the sea not far south of the Faeroë Isles; the Seine, gathering the waters of the south of England and north of France in its flow, continued its course through the fertile plains of the English Channel till it entered the Atlantic a hundred miles west of the farthest point of Brittany or Cornwall; and the deepest parts of the Irish Sea formed great fresh-water lakes stocked with ancestral salmon.

In the south we might look in vain for the Adriatic, and in place of the Mediterranean we should discover two restricted inland seas, separated by a broad isthmus, which extended from Northern Africa, through Sicily, into Southern Europe.

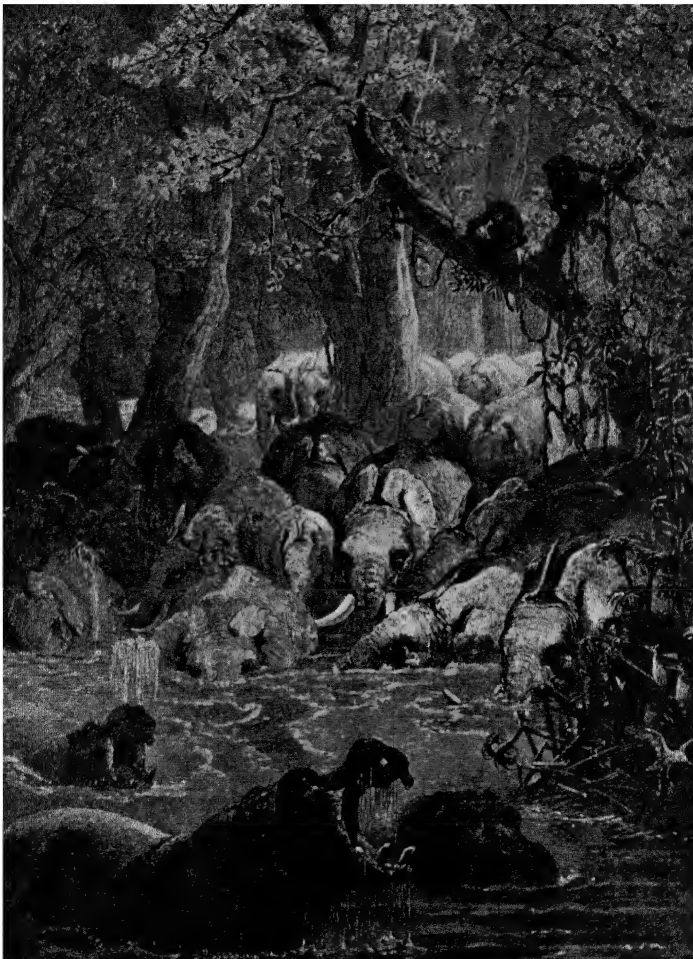
On the extreme east Asia was probably united with America, across Behring Strait, by a tract of land which extended an unknown distance to the south, perhaps completing the arc of the Aleutian Islands, now represented on the map by a mere dotted line.

On the extreme west and north an ancient bridge, afterwards to break up into Iceland and the Faeroës, was possibly still standing, and united Europe with Greenland and the east of North America; but this is an open question, to which we shall refer later.

In some places, on the other hand, the sea penetrated farther into the land, as where the Arctic Ocean covered all the region of the gulf of the Obi.

A traveller starting in this ancient world from the banks of the Thames could have made his way over the watershed formed by the Straits of Dover into France, and so through Italy and across Sicily into Africa, which would have then lain open to him from end to end. If instead of entering Africa he had turned

to the left, he could have reached India by devious paths; the Malay peninsula, and the East Indies, united



(Africa). (After Wolf.)

here and there by land-connexions, would have taken him, with the help of a frail canoe, into Australia, whence he might have wandered into Tasmania.

If he had wished to visit North America he would have had, perhaps, a choice of routes, either by the Icelandic bridge or the Alaskan isthmus.

Even before leaving England he would see strange sights by the way; great herds of elephants of an ancient kind (*Elephas antiquus*), the mightier predecessors, perhaps ancestors, of the mighty African

FIG. 54.—The sabre-toothed tiger (*Machairodus neogœus*). Attention may be called to the widely open mouth. In adaptation to the great length of the tusks, and to permit it to get out of their way, the lower jaw was provided with a peculiar articulation, so that it could move backwards through nearly a right angle. (From Osborn, after C. R. Knight.)

elephant would perhaps come trampling across his path; he might witness, not without awe, the infuriated rush of the soft-nosed rhinoceros (*Rhinoceros Merckii*), which bore a horn sometimes as much as three feet in length; disporting itself in the rivers was that shy behemoth the hippopotamus (Fig. 53), the mother animal swimming with her young upon her back; sometimes he might catch sight of the great sabre-toothed tiger, Machairodus (Fig. 54), making its stealthy spring, or

hanging, with its great overgrown canines, on to the flanks of a strayed elephant. If he waited by the water places he would be able to watch herds of bison, wild horses, and various kinds of deer, the Irish elk among them, as they came to drink.

A delightfully warm climate might tempt the traveller to make his bed in the open, but, in any case, he would do well to beware before accepting the shelter of a cavern, for there he might encounter the terrible cave-bear, larger than any existing species, or an animal even still more terrible, no other than man himself.

Unfortunately, we have no time-machine by which to revisit these scenes; we must content ourselves by laboriously piecing together the evidence, still more laboriously obtained, which lies sparsely scattered in the gravel of river terraces or in the débris of ancient caves, which is fragmentary at the best and consequently too often full of apparent contradictions. He who attempts to construct a consistent story will sometimes wonder whether he may not be weaving a rope of sand. Classifications are made only to be unmade, and as finer and finer subdivisions are proposed, so our difficulties seem only to increase. This is the darkness which precedes the dawn. Already indeed minute attention to details, not omitting the apparently most insignificant, is producing its effect; the darkness begins to break, and amidst much that is confused certain facts stand out in bold relief.

Man as we first meet with him is a hunter, not by choice but from necessity, winning a precarious existence from the chase of wild beasts and the collection of grubs, eggs, and other edible products, especially those afforded by wild plants. Nature as he knew her was as yet untamed, though he had already wrested two great

powers from the inanimate world, the first that of transforming energy into fire, and the next that of concentrating its effect by means of an edge given to a stone.

Many thousands of years, attended only by a gradual advance, were to elapse before he achieved any epoch-making victory which could compare with these, and then he made two great strides, which led him to the mastery of the organic world. He discovered that wild plants could be grown at will, and that herds of wild animals could be tamed and kept in a state of captivity. From hunter he became shepherd and farmer, abandoned his roaming hand-to-mouth mode of life, and, assured of ample means of subsistence, became attached to the soil; settled communities thus arose, organised societies became possible, and all the advantages which accrue from the subdivision of labour.

This triumph preceded by a long interval the discovery of metals, and some of the stone implements of the primitive agricultural stage are in no respect superior to their predecessors. On the other hand, many attain a perfection which leaves no room for improvement. A complete mastery over stone had been acquired; it was chipped by an admirable technique into implements which are distinguished as much by their artistic beauty as by their perfect adaptation to the ends for which they were designed. Such implements were well worthy of the additional labour which was often bestowed upon them, as when they were smoothed by grinding on sandstone and finally polished so as to give increased hardness as well as beauty to the surface.

It is these polished implements which have afforded a distinctive mark to the period, so that it is often spoken of as the polished stone age; and the Stone Age as a whole is divided not according to its most

fundamental differences into a hunting and an agricultural stage, but according to the nature of its weapons into the earlier flaked and the later polished stone ages.

The newer and older stone ages thus recognised have been conveniently named [1] the Palæolithic and the Neolithic periods.

The presence of polished stone implements, though distinctive of the Neolithic period, is not essential. When stone implements are discovered their place in our classification is determined on a variety of evidence, first and foremost on their position in the stratified series, next on the species of animals associated with them, and finally on the nature and fashion of the implements themselves.

Our knowledge of the Ancient Hunters or Palæolithic men has made extraordinary progress during the past three decades, especially in France, which has afforded a fertile field of discovery to a brilliant band of investigators. The remains of successive hunting races are found in the deposits of caves, river gravels and other sediments, which are spoken of collectively as the Palæolithic series.

The Palæolithic series may be divided into two groups—an upper and a lower. This proceeding will at all events provide us with useful general terms. These groups may be further subdivided into stages as follows.

Upper Palæolithic	Azilian stage
	Magdalenian stage
	Solutrean ,,
	Aurignacian ,,
Lower ,,	Mousterian ,,
	Acheulean ,,
	Chellean ,,
	Strepyan ,,

[1] Sir John Lubbock, *Prehistoric Times*, London, 1865, p. 60.

The Lower Palæolithic stages are widely distributed, and the order in which they succeed each other in time has been determined by a variety of observations extending over a long period, but most fully by the study of the sections at St. Acheul on the Somme.

The valley of the Somme is classic ground; it was there that Boucher de Perthes[1] made his famous discoveries, and that Gaudry, Falconer,[2] Prestwich[3] and Evans[4] found confirmation of the truth of those discoveries; G. de Mortillet has investigated it, and more recently it has been studied in great detail, particularly at St. Acheul, by Victor Commont.[5]

It is above all to the brilliant researches of Commont, continued with extraordinary insight and perseverance over many years, that we are indebted for

[1] Boucher de Perthes, *Antiquités celtiques et antédiluviennes*, Paris, 1847.

[2] Hugh Falconer, "Primeval Man and his Contemporaries," pp. 570–600, in particular 596–599, in *Palæontological Memoirs*, vol. ii, London, 1868.

[3] J. Prestwich, "On the Occurrence of Flint Implements, associated with remains of Animals of Extinct Species in Beds of a Late Geological Period in France, at Amiens and Abbeville, and in England at Horne," *Phil. Trans.*, 1860, pp. 277–317. (This contains a note by Sir John Evans, p. 298.)

[4] John Evans, "On the Flint Implements in the Drift, being an Account of their Discovery on the Continent and in England," *Archæologia*, 1860, xxxviii, pp. 280–307.

[5] V. Commont, "Les Industries de l'ancien Saint-Acheul," *L'Anthr.*, xix, pp. 527–572, 1908. "L'industrie de l'âge du renne, dans la vallée de la Somme," *Compte rendu de l'Association Française*, 1908, pp. 634–645. "Montières-les-Amiens (Dépôts Quaternaires)," *Assoc. Préhist. Congrès de Lille*, 1909, p. 437. "La faune quaternaire dans le Nord de la France," *ibid.*, p. 445. "Industrie des graviers inférieurs de la haute terrace de Saint-Acheul," *ibid.*, p. 774. "Saint Acheul et Montières," *Rev. préhistorique*, 1909, N. no. 10. "Industrie moustérienne dans le Nord de la France," *Congrès de Tours*, 1910. "Les terrasses fluviales de la vallée de la Somme," *Bull. Archéologique*, 1911, 27 pp. "Chronologie et stratigraphie . . . du Nord de la France," *Congrès international d'Anthropologie*, 1912, xiv, p. 240. *Les hommes contemporains du Renne*, Amiens, 1913, pp. 438, 154 figs., 1 map.

Victor Commont is no more: he died a victim to the organized robbery with murder which was the German war. I mourn a friend and Science one of her most gifted sons.

our knowledge of the remarkable story which this valley affords. He has unravelled its deposits, so puzzling in their complexity, and has provided us with geological sections which show in their true chronological order nearly all the great stages of human industry that have successively flourished on the soil of Europe from the early Strepyan onwards through all the other stages of the Palæolithic epoch and then through the Neolithic to the ages of Bronze and Iron. It is to this region there-

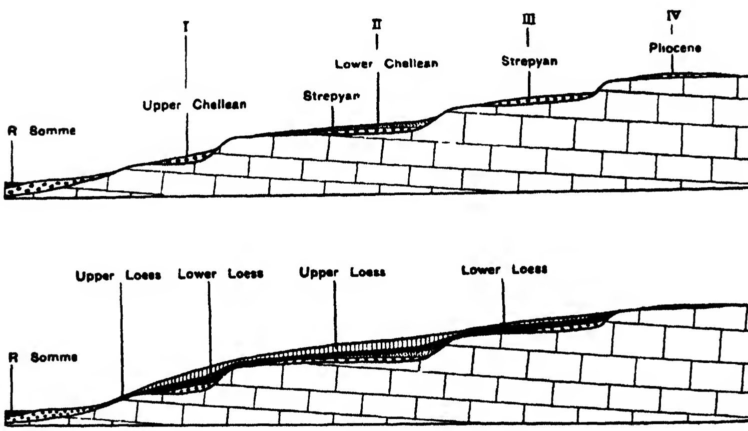


FIG. 55.—Diagrams of the terraces of the valley of the Somme. The upper figure shows the steps covered with the ancient deposits of the river; the lower figure shows the overlying löss. The lower löss has been extended by mistake over the first terrace.

fore, as the standard to which all others may be referred, that we will first turn our attention.

The river Somme flows through a broad valley which it has eroded in the chalk. The rate of erosion was not uniform, but accelerated at three successive intervals, so that, disregarding the superficial deposits, the sides of the valley do not present a uniform slope, but are cut out in four successive steps (Fig. 55), which are named by number in the order of their succession counting from below upwards; the lowest but one—owing to its not

having been sufficiently distinguished from the lowest, which forms the actual valley bottom—being taken as the first; while the second is often spoken of as the middle step.

Deposits of gravel, sand, and other overlying sediments rest on these steps, forming corresponding terraces, which are far less accentuated than the steps they conceal.

The existence of the steps and the structure of the terraces have been revealed by numerous artificial excavations—gravel-pits, drainage works and the like.

In commencing our study of these features, let us disregard for the moment the more superficial deposits, and confine our attention to the steps and the associated fluviatile gravels and sands.

The Steps.—The basin of the Somme lies completely outside the regions covered by the great glaciers, and consequently was not directly affected by the waxing and waning of the ice. Yet the changes in climate to which the Alps and Northern Europe bear witness were too general to have been without any effect in the valley of the Somme, and so we shall find that changes in the amount of precipitation, whether of snow or rain, and still more in the system of the winds, have left their record in its superficial deposits.

The more fundamental features expressed in steps and terraces have already received an explanation, and as this does not depend on climate, but on changes in the relative level of land and sea, it remains unaffected and stands in need of no kind of modification.

The Sands and Gravels of the Terraces.— It has long been admitted, as sufficiently obvious, that the gravel of each terrace is scarcely separable in origin from the step on which it lies; it may indeed be regarded as the very same gravel as that which the river employed

in eroding the step, and the overlying sands may be attributed to floods, which occurred before the river had cut its way much deeper down.[1]

Thus the gravels correspond in age with the steps and the order in which these succeed one another from above downwards is the order of their formation in time.

In the deposits of the fourth or highest—and therefore the oldest—terrace no human artefacts are found, but the gravels of the next or third terrace afford numerous implements of the Strepyan stage, and these are also met with, though rarely, in the gravels of the second terrace. The gravels of the second terrace, with their Strepyan implements, are overlain by sands which were deposited while the river was sinking its way down towards the first terrace, so that, as their superposition would imply, they are slightly younger than the gravels beneath them. It is in these sands that we find the "typical" Chellean implements. Finally, in the gravels of the first terrace remains of the Upper Chellean industry occur. The gravels below the river, which may be regarded as a submerged terrace, are inaccessible to observation.

It would thus appear that when the excavation of the valley commenced, man had not yet entered the country; but by the time the river had descended to the third step it was already occupied by the people of the Strepyan stage; this industry lasted till the second step had been cut out and covered with gravels, when it was succeeded by the Chellean which came to an end some time after the formation of the first step.[2] Thus

[1] A slight subsidence after the cutting of each step may be assumed to account for the deposition of the gravel.

[2] In order of time the last. In France the terraces are numbered from below upwards and the heights measured from the surface of the river as zero; this is a geometric method: in England they are numbered from

the excavation of the valley was accomplished in large part during the Chellean and Strepyan ages, in the course of which the river succeeded in wearing its channel downwards for over 50 m.

Superficial Deposits.—We now pass to the later deposits—a complex of loams, löss, and brick-earth with occasional pebble beds—and will begin with the löss, a remarkable formation of great importance to our study.

It is a yellowish-grey or brown deposit of very minute particles, the merest dust indeed, consisting chiefly of quartz and carbonate of lime, and with so small an admixture of clay that the mixture possesses no plasticity, but is, on the contrary, extremely friable.

The löss shows no signs of stratification, is often broken up by numerous joints and traversed by long, narrow, almost vertical tubes.

It extends over wide tracts of country in Europe, Asia and America: always maintaining a uniform character, it sweeps over hill and valley, rising sometimes to a height of 2400 m., and attaining a thickness of 40 m. or even, as in China, of 400 m.

It owes its formation, as was shown by Baron von Richthofen, to the wind which, heavily laden with fine dust, sweeps over the grass-grown steppe, parting with its burden on the way; as the dust accumulates it begins to smother up the grass, which struggles upwards to maintain its existence, and it is the rootlets of this long grass which give rise to the long tubes in the löss. Plentiful snails live on the steppe, and their dead shells are buried in the dust as it continues to fall. Consequently all the fossil shells in the löss are those of land

above downwards, an historical method. We have followed the French method, which possesses certain advantages over our own.

snails, the commonest among them being *Pupa muscorum*, *Succinea oblonga* and *Helix hispida*.

In China, as Richthofen was able to observe, the löss is still in process of formation; in Europe it was a product of the Pleistocene epoch. Glaciers bring down with them the fine powder they have ground from the rocks over which they flow, and the water which escapes from them as they melt is so fully charged with this that a glass of glacier water looks like milk. The muddy water of the Pleistocene ice-sheets was spread over wide areas, and on drying the mud was swept away by the wind and deposited over the adjoining country.

The ice-sheets cooled the air above them and so produced an anticyclone which was maintained over Northern Europe as long as the ice lasted, and out of this anticyclone the winds blew in all directions, radiating from it as from a centre. Thus the löss was laid down as a broad fringe outside the glaciated region (Fig. 6, in which the löss is indicated by dots).

It follows that the löss was not formed continuously throughout the whole of the Pleistocene epoch, but only during its Glacial episodes. For each episode there should correspond a separate sheet of löss, but only three have been preserved; one, known as the older löss, corresponds with the Tyrrhenian glaciation, the others form together the younger löss, which is thus represented by two sheets: this is explained by the fact that the last glaciation, during which it was formed, was effected in two stages—first the ice advanced to its maximum limit, and during this advance one sheet of löss was deposited, then followed a retreat and next a second advance, with the formation of the second sheet of löss.

The composition of the löss, the minuteness of its particles, its distribution outside the margin of the

glaciated area, and the fact that it never intrudes within the area of the glaciation to which it corresponds, all afford consistent evidence in support of this explanation.

A final confirmation is afforded by the fossils it contains; besides the three land shells already mentioned there are multitudes of others, none of them belonging to the warmth-loving species of Southern Europe: the fauna as a whole is palæarctic and high Alpine.[1]

It is the same with the mammals; in addition to a few indifferent species there are such cold-loving forms as the reindeer, musk ox, Arctic glutton, Arctic hare, ziesel, banded lemming, and bobac, all species of the tundra. With them are associated dwellers in the steppes.

The loam,[2] to which we now pass, has also a special significance. After a sheet of löss had been formed during a glacial interval the climate became genial. Rain watered the löss, sank into it and percolated downwards for a considerable depth. In its passage it decomposed such particles as contained iron in their composition and oxidised the iron, which then imparted its rusty colour to the deposit; further, it dissolved out the finely divided carbonate of lime and carried this with it in solution as it filtered down to a rest level. There it deposited the carbonate of lime in odd-looking nodules which are called *löss-kindeln*, or *löss-püppchen*, or *poupées du löss*.

The upper part of the löss thus transformed by "weathering" is loam. The loam is decalcified and oxidised löss, and just as the löss marks a glacial, so the loam marks a succeeding genial interval.

Further than this, the longer the löss is exposed to

[1] The löss on the slopes of Mont d'Or (Lyons) contains at a height of less than 625 m. a snail fauna which now lives in the Alps at a height of between 2000 and 2500 m. (Locard in Soergel, *Lösse, Eiszeiten und Paläolithische*, Jena, 1919).

[2] Brick-earth is merely a superficial layer of loam.

weathering, the deeper down does it become converted into loam, and thus from its thickness some inference can be drawn as to the relative duration of successive genial periods. It is on arguments of this kind that Pinck largely depends in assigning so much longer a duration to the Lower Tyrrhenian than the Lower Monastirian age.

It is obvious that the deeper the weathering extends the larger should the *löss-püppchen* grow, as in fact they do. The *püppchen* of the older löss are markedly larger than those of the younger löss.

Let us now return to the Somme. The older löss mantles over the second and third terraces, covering up the underlying sands and gravels of which they consist. It must therefore have been deposited after the formation of these terraces, and since it was formed during the third Glacial episode (Upper Tyrrhenian), the terraces must be older than this episode, and, as we have already seen reason to believe, both the terraces are older, the second terrace being of Lower Tyrrhenian and the third of Lower Milazzian age.

The younger löss lies immediately upon the first as well as the older terraces, and here once more we find a confirmation of our previous conclusions, for the younger löss was the product of the fourth and last glaciation (Upper Monastirian), and the terrace is thus, as it should be, Lower Monastirian.

The younger löss, which is also known as the ergeron, probably corresponds only with the lower sheet of this formation, the upper having been removed by denudation; it is divided into three beds by intercalated layers of angular gravel, and it is probably not wholly of Æolian origin, but an admixture of true löss and rain-wash. The north of France was then, as it is now, more or less under the influence of an oceanic climate which made

itself felt in three rainy periods, during which some of the löss was washed away and angular fragments of flint were strewn over its surface.

All three layers of the younger löss on the second terrace have furnished implements of the Upper Mousterian industry, which is thus accurately dated as Upper Monastirian.

The Aurignacian has not been found in the löss of the second terrace, but it occurs on two horizons in the upper ergeron of the first terrace. Finally, near the summit of the brick-earth rare implements of Solutrean workmanship are occasionally met with. The Magdalenian is another industry which is absent from this terrace, but Magdalenian implements have been dredged from the bed of the river. This industry is apparently younger than the latest löss of the Somme; the interval which separates it from our own times is comparatively short, and is represented in the valley of the Somme merely by a growth of peat and recent river alluvium.

The older löss similarly consists of three beds separated by layers of gravel: the upper bed is a red loam (*limon rouge*) and contains Acheulean implements; the middle, a loam speckled with black dots (*limon à points noirs*); the lower, a red, sandy loam (*limon rouge sableux*). At the base of the lower bed is a gravel which sometimes cuts into the underlying river sands, "ravining" them, as the French express it.

The Acheulean implements in the uppermost bed thus mark the close of the third Glacial episode (Upper Tyrrhenian). We shall see later how these conclusions are confirmed and extended by observations in other regions.

The valley of the Thames may now engage our attention.

We have already, at the opening of this chapter,

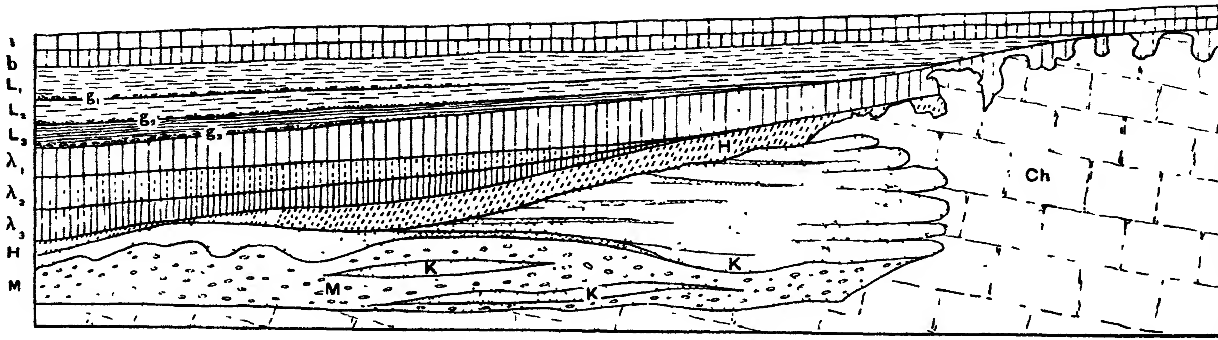


FIG. 56.—Section through the second terrace of the Somme at Saint Acheul.

a. Rain-wash; recent to Neolithic.
b. Brick-earth (weathered löss); Upper Aurignacian and Solutrean.
L_1. Upper ergeron, underlain by gravel (g_1); Mousterian.
L_2. Middle „ „ „ (g_2); Mousterian with rare bouchers.
L_3. Lower „ „ „ (g_3); „ with many bouchers.
λ_1. Upper derm; in upper part, Upper Acheulean.
λ_2. Middle „ red sandy loam; with red deer.
λ_3. Lower „ sands with gravel at base, Acheulean.
H. White sandy loam with land shells.
K. White fluviatile sand; Chellean (typical).
M. Gravels with flint pebbles, and *E. antiquus*; rare coarsely worked bouchers.
Ch. Chalk passing into tongues from which fragments are detached as "presle."
"Ergeron" is the name used in Belgium for the younger löss.
"Derm" is adopted here to signify the older löss.

presented a picture of Europe such as it might have appeared during the palmy days of the Chellean age, but if the river terraces have the significance we have attributed to them, Europe must have possessed a very different geography during the intervals of submergence. In the diagram (Fig. 57) the British Isles are represented as they would appear if uniformly submerged to a depth (1) of 300 feet and (2) of 500 feet below their present level, *i.e.* at the beginning of the formation of the fourth terrace, or in the Sicilian age.

It is possible, and indeed very likely, that this submergence was not uniform. The movements of Scandinavia and Northern Europe appear to have followed a different law. The southern half of England, however, seems to have been subject to the same régime as prevailed in the Mediterranean lands and elsewhere.

The Sicilian terrace of the Thames is very clearly defined and has been studied at Boar's Hill, near Oxford, where it is found at a height of 108 m. above the river.

Its investigation has led to results which rather complicate our history, but they are, I think, too interesting to be passed over in silence. The terrace is formed of a gravel which might be described as a boulder clay without any clay, the place of the clay being taken by sand and gravel. It contains far-travelled erratic rocks; some of them large subangular fragments of ancient lavas (rhyolite) which find their closest resemblance in the ancient rocks of Devonshire,[1] others are tourmaline grits and veinstones, such as occur in the mineral lodes of Devonshire and Cornwall. Some of them are marked with characteristic glacial striations,

[1] I take this opportunity to express my best thanks to Dr. Flett, formerly Petrographer to the Geological Survey and now its Director, and to Dr. H. H. Thomas, the present Petrographer, for their confirmation of this statement.

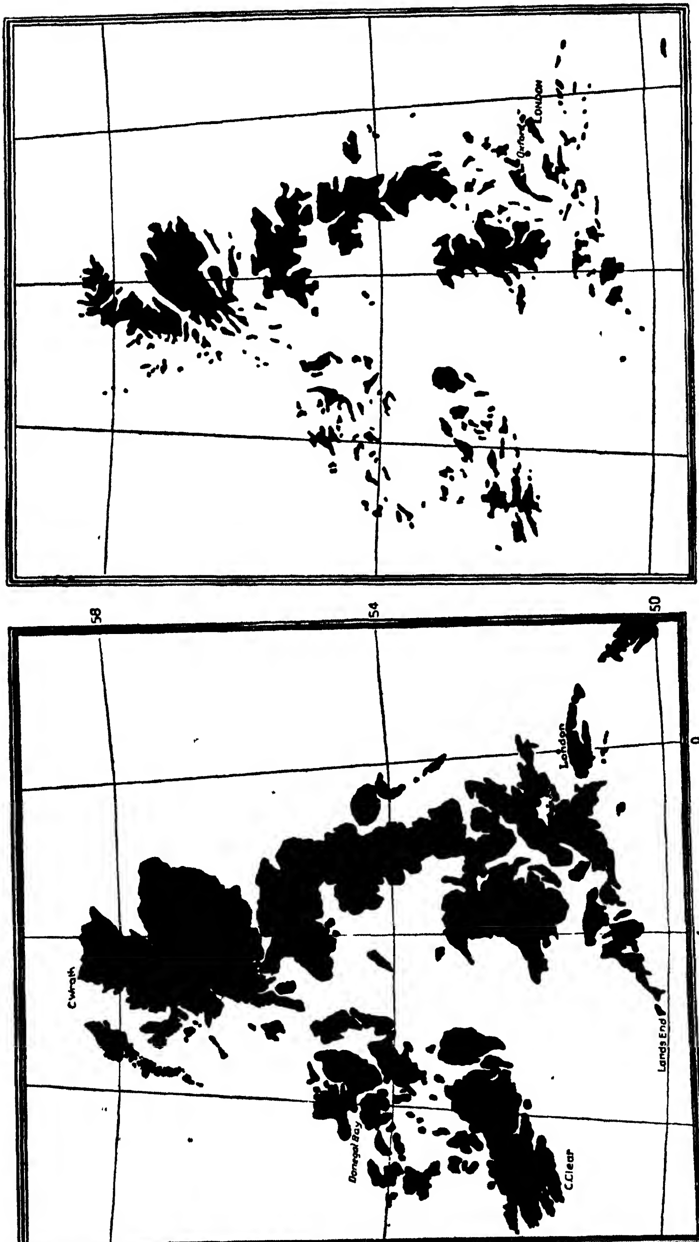


FIG. 57.—The British Isles submerged to a depth of (1) 300 feet and (2) 500 feet.

and similar striations have been recorded by Dr. Salter [1] on a fragment of an igneous rock (felsite) which he found in this terrace, but in another locality.

All the characteɪs of this deposit point to the agency of ice, and to transport from the peninsula of Cornwall and Devon. It is generally supposed that Devonshire enjoyed an immunity from the ice of the Pleistocene period, but I am able myself to testify to the existence of one valley glacier, which has left a terminal moraine composed of tourmaline grit precisely similar to that found on Boar's Hill. This I doubt not was one of the sources of supply.

The erratics, however, can scarcely have been transported by land ice; there is no evidence for that and much against it; they must have come by sea, carried on rafts of floating ice or small icebergs.

But although the Sicilian terrace is only 108 m. above the level of the Thames at Oxford, it is 165 m. (540 feet) above the level of the sea, and thus the southern part of England must have been submerged at least to this, and possibly to a greater, extent at the time the ice grounded and discharged its load of débris on Boar's Hill. This conclusion finds partial confirmation in the occurrence on Bowsey Hill,[2] at a height of 145 m., of material brought from the south similar to that already described.

Thus we encounter a striking contrast to the picture with which we started. We now gaze upon an archipelago of rocky islands scattered through an icy sea, some of them supporting small valley glaciers which, loaded with rocky fragments, flow slowly downwards and enter the sea. There they break off in icebergs which

[1] A. E. Salter, "On the Superficial Deposits of Central and Parts of Southern England," *Proc. Geol. Assoc.*, xix, Part I, 1905, p. 18.

encumber the coast or are carried away by some northerly current to distribute their cargo among those little islands which are all that is visible of southern England.

Startling as this exposition may appear in the light of existing opinion, it follows directly from the facts and supplies an explanation of phenomena which were known long ago to Phillips and Prestwich and had led them to recognise the existence of a Southern Drift.[1]

The next event which followed after the transport of the Southern Drift was a sinking of the sea till it stood about 100 m. above its present level, and Boar's Hill the same height above the level of the Thames. Then the Avon, at that time a tributary of the Thames, brought down from the Midlands vast quantities of quartzite pebbles, and these, intermingled with the glacial erratics, built up the Sicilian terrace.

The sinking of the sea or the rise of the land was then renewed with temporary arrests and the formation of terraces at 91 m. and 81 m. According to the Rev. C. Overy [2] there are indications that the climate continued to be cold down to the formation of the terrace at 81 m., but when elevation again set in it began to improve, became warm at the next arrest when the terrace of about 71 m. was formed, and really genial by the time the sea-level had fallen to between 61 m. and 65 m. At this stage a plentiful deposit of gravel accumulated and a broad terrace was formed which is known as the Tilehurst plateau. It corresponds with the Milazzian terrace, which in the valley of the Somme contains implements of the Strepyan industry, and a fauna resembling that of the forest-bed of East Anglia.

[1] A similar conclusion has been reached by Prof. S. H. Reynolds, who has described erratics of Augite Picrite on the Mendips at about 400 ft. (123 m.) above the sea level. These appear to have been transported from Clicker Tor, Menheniot, Cornwall. (*Geol. Mag.*, lvii, 1920, p. 224.)

[2] C. Overy on "Glacial Succession in the Thames Catchment Basin," *Proc. Geol. Soc.*, 1923, p. 100.

The next terrace is found at a level of 40 to 50 m., and presents signs of a colder climate: near Reading it has yielded implements of a primitive Chellean industry to the researches of the Rev. C. Overy. The terrace succeeding this at 30 m., and thus corresponding with the Tyrrhenian terrace, was evidently formed during genial conditions; it contains abundant remains of the warm fauna and typical Chellean bouchers. The last two terraces at 21 to 25 m. and 12 to 15 m. require further investigation. At Summertown, near Oxford, the lower of these terraces has been shown by Dr. K. S. Sandford to consist of gravels which are divided by an intervening bed containing *Corbicula fluminalis* into two series, a lower one, containing the cold fauna (mammoth) and an upper one with a warm fauna (*E. antiquus* and hippopotamus); but implements are absent. The lower gravels evidently belong to the penultimate glaciation (Upper Tyrrhenian), the upper gravels to the last genial episode (Lower Monastirian).

Further down the Thames, at Crayford, is a terrace which presents a marked resemblance to the second terrace of the Somme at St. Acheul. The underlying rocks, here as there, are chalk, capped by Thanet Sands, and the chalk forms a cliff from which "presle" is derived. The terrace gravels, which have furnished Acheulean implements, are covered by a thick deposit of brick-earth, with an intercalated bed of sand containing *Corbicula fluminalis*, a bivalve shell which is extinct in Europe but still inhabits the waters of the Nile as well as some rivers in Tibet and elsewhere in Asia. It is frequently found in association with hippopotamus and indicates a warm climate; the age of the bed containing it in this instance is thus shown to be Lower Monastirian; the brick-earth below it with a cold fauna is consequently Upper Tyrrhenian, and that above, also with

a cold fauna, Upper Monastirian. This conclusion is confirmed by the identification of the brick-earth with the older and younger löss of the Somme, which was made by V. Commont when he visited Crayford some years ago.

The land continued to rise after the formation of this Crayford terrace till it stood about 28 m. higher than it does to-day. The final movement was one of subsidence to its present level. In this concluding part of its history the Thames agrees with the Somme. We shall refer again to this later (p. 208). Thus so far as our knowledge of the Thames extends it presents a striking parallel with that of the Somme, and as research proceeds a similar succession of industries and terraces is found to prevail over a great part of Europe.

Belgium, which until lately offered a standing difficulty by a discordant interpretation, has now under the illuminating influence of Victor Commont's discoveries been brought into complete harmony with the rest of Europe. The first step towards reconciliation was taken by M. Marcel de Puydt,[1] who, with his colleagues MM. Hamal-Nandrin and J. Servais, was able to prove that the series of deposits known in Belgium as the Hisbayan, correspond as a whole with the younger löss of the Somme and elsewhere, and, as at St. Acheul, contain a Mousterian industry. Prof. Rutot was thus led to revise his former interpretations and to show how closely the terraces and industries of the Meuse, the Trouille, the Lys and the Senne resemble those of the Somme. In the valley of the Meuse they seem to make even a closer approach to the heights which distinguish the four terraces of M. Depéret, for their respective heights above

[1] Marcel de Puydt, Hamal-Nandrin, J. Servais, "Liége Paléolithique, Le Gisement de Sainte-Walburge," *Bull. Inst. Archéologique Liégeois*, xlii, 1912, pp. 139–215, 6 pls., and separately published, Liége, 1913.

the river are said to be 100, 65, 35 and 10 m.[1] In the valleys of the four other rivers their heights are not far different. It is found as a general rule that the gravels of the third terrace afford Strepyan implements only; those of the second Chellean; and of the first Upper Chellean and Acheulean. The younger löss of the first terrace has yielded Aurignacian and Mousterian.

The famous section at Hélin in the first terrace of the

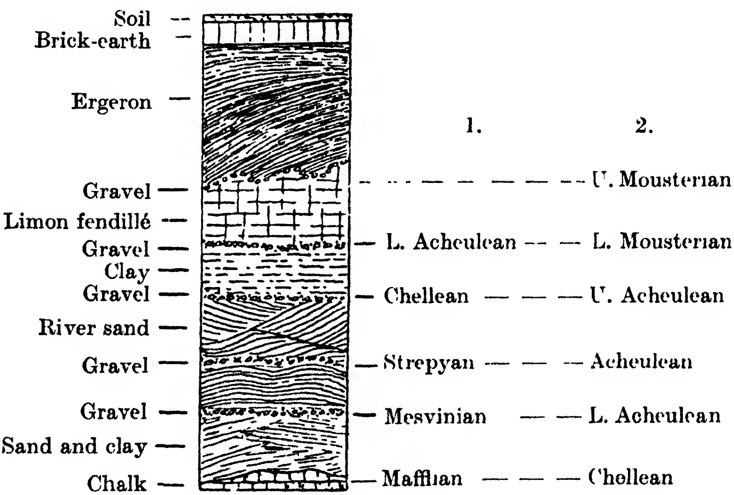


FIG. 58.—Section at Hélin through the first terrace of the Trouille. 1. First interpretation. 2. Second interpretation by Rutot.

Trouille has thus ceased to be anomalous. Its previous and present interpretations by M. Rutot are shown in Fig. 58. V. Commont's rendering of the same section is given in Fig. 59.

Although the Lower Palæolithic industries of Belgium bear the classic French names, they differ from them in a very remarkable and deceptive manner: in general their identification depends not on any intrinsic evidence, but solely on their stratigraphic position.

The Chellean (Mafflian) and Acheulean (Mesvinian)

[1] These observations are open to serious criticism. See M. Fourmarier, "Les Terrasses de la Meuse," *Rev. Anthr.*, Année xxxi, 1921, p. 378.

implements are usually represented by simple flakes of flint or brown chert with "a distinctly eolithic facies,"[1] and the elaborately worked bouchers so characteristic of these industries elsewhere are conspicuously absent.

This has led to the suggestion that Belgium and eastern Europe may have formed a separate cultural province, in which the Acheulean was replaced by a primitive Mousterian (Mesvinian) industry.[2] England, however, which is remarkably rich in Acheulean bouchers,

B
L_1
L_2
L_3
A
T
C

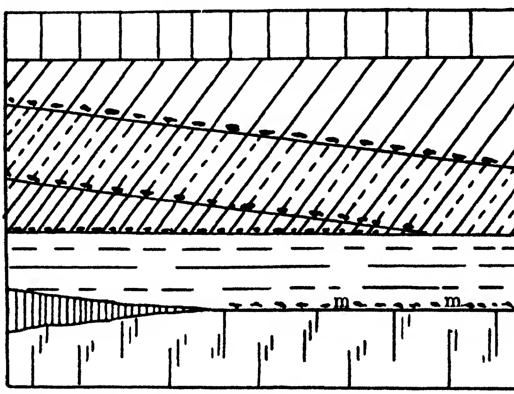


FIG. 59.—Section at Hélin, according to M. Commont. B. Brick-earth; L_1, L_2, L_3, the three layers of the younger löss; A, Fluviatile sands and gravels; m.m, Mesvinian; T, Thanet sands (remanié); C, chalk.

has furnished a "Mesvinian" industry to the researches of Mr. Hazzledine Warren at Clacton-on-Sea.

From this summary account of the river terraces of southern England and northern France it might be assumed that the only movement of the land was that of a continual rise from the Sicilian to the Monastirian age; but this is unlikely. The movement was more probably one of great upward movements[3] followed by

[1] A. Rutot, "Le Quaternaire de la Belgique," *Bull. Soc. Belge de Géol.*, xxix, 1919, pp. 172, 173, 177. They were originally regarded as "eoliths." See *Ancient Hunters*, 2nd ed., pp. 133–137.

[2] H. Obermaier, *Anthropos*, xiv, xv, 1919, 1920, p. 147.

[3] In the valley of the Inn there is evidence of an elevation of 200 m. during the Lower Tyrrhenian age. See F. Levy, *Quatär-Studien in den Chiemgauer Bergen*, Berlin, vol. i, p. 3, 1922.

subsidences, as we have already indicated. It seems necessary to assume this in order to account for the successive invasions of different faunas.

The Strepyan Stage.

The name of this stage, which is known to French archæologists as the Pre-Chellean, seems to have originated in some error; it is taken from Strépy, a locality in Belgium where unfortunately the Strepyan industry does not exist.

The inconvenience involved in a change of names is, however, so great, so much greater than any which can result from condoning a flaw in the genealogy, that I leave it to others to propose a new one, at the same time pointing out that Strepyan is employed here as a mere collocation of letters to indicate an industry which occurs next in order below the Chellean.

The distinctive character of the Strepyan industry, according to M. Rutot, is that all the implements retain a considerable part of the original crust of the flint nodule from which they have been fashioned. This, however, is only a question of degree, for many of the Chellean and Acheulean bouchers present the same peculiarity.

Coarse examples of side-scrapers (racloirs), end-scrapers (grattoirs), and notched scrapers (lames à encoche) are not uncommon, as well as primitive forms of the boucher (Fig. 60).

Some very remarkable forms, closely resembling a dagger, have been described by M. Rutot. One of these has been shaped out of an elongated flint nodule, such as commonly occurs in the neighbouring chalk; one end has been cleverly chipped into a rude blade, the other has been left unworked to serve as a haft. The

black flint exposed on the worked surface is in striking contrast to the opaque dead white crust of the haft and presents an astonishingly fresh appearance, without any sign of patination. In some cases a natural swelling of the nodule occurs just below the blade and has been fancifully compared to a guard. By many investigators these daggers are regarded as forgeries.

The primitive Chellean implements (Fig. 61) found by

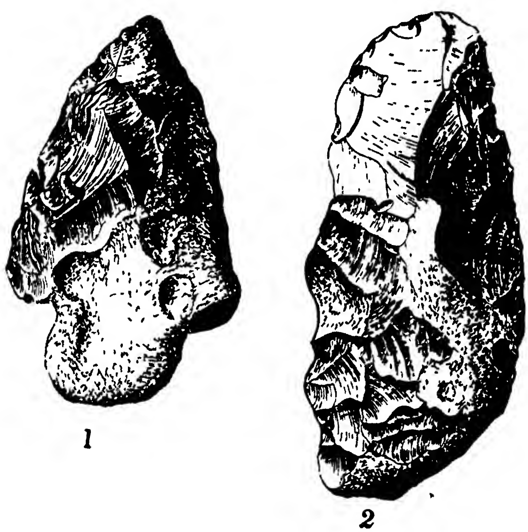


Fig. 60.—Strepyan implements. (1) A boucher; (2) a coarse knife. From St. Acheul. (After Commont, *L'Anthropologie*. × ⅓.)

Mr. Overy in the 40–50 m. terrace near Reading may be referred with great probability to this stage. The Strepyan stage is also said to occur at the base of the 30 m. terrace of the Thames near Swanscombe.

The industry is typically represented in the gravels of the third terrace of the Somme at St. Acheul, but it also occurs at the base of the gravels of the second terrace. No fauna has been found in association with it at Amiens, but the fluviatile gravels of the third terrace

Fig. 61.—Primitive Chellean or Strepyan implements. 1, a knife; 2, 3, a boucher seen (2) from below and (3) from above. From the 40–50 m. terrace of the Thames, near Reading. (Photographs by the Rev. C. Overy. × $\frac{2}{3}$)

at Abbeville, further down the Somme, which correspond with those yielding Strepyan implements at St. Acheul, have afforded a very interesting assemblage of species, strongly recalling the fauna of the forest bed at Cromer. It includes two species of elephants, *E. meridionalis trogontherii*, Pohlig, and *E. antiquus*; a hippopotamus, three species of rhinoceros, *R. Mercki*, *R. etruscus*, and *R. leptorhinus*; the sabre-toothed tiger, *Machairodus*; several species of deer, including *Cervus solilhacus*, *C. somonensis*; and a horse, *E. stenonis*.

The Chellean Stage.

The distinctive Chellean implement is the boucher. It is not unlike in size and form two hands apposed palm to palm (Fig. 62), but it may attain a length of ten inches or, in rare exceptions, may not exceed two or three inches. Most commonly it is somewhat almond-shaped, sometimes it is more triangular, and rarely oblong with rounded ends. Not uncommonly it retains a part of the surface of the original nodule or pebble from which it has been shaped.

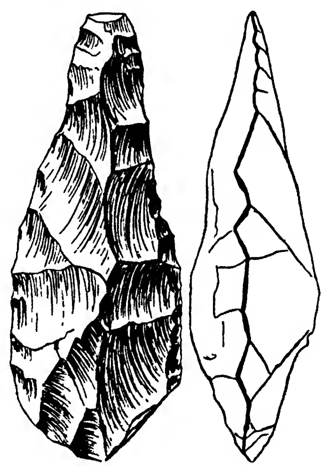


Fig. 62.—A Chellean boucher, seen "en face" and from the side; found at Chelles. (After Chouquet. × ½.)

It has been dressed by coarse flaking on both sides, and the flaking of opposite sides meets along the edge in a wavy line, so that this edge, which was used for cutting or scraping, is characterised by its irregularity.

At St. Acheul some of the bouchers are distinguished by a thick butt end and a much thinner, elongated, distal

end. These are known to the workmen as "ficrons." Other more ovate forms are known as "limandes" (Fig. 63).

As we have already seen, the boucher was perhaps used without the intervention of a helve. At the same time, too much stress should not be laid on its analogy with the Tasmanian implement, for that was used in a

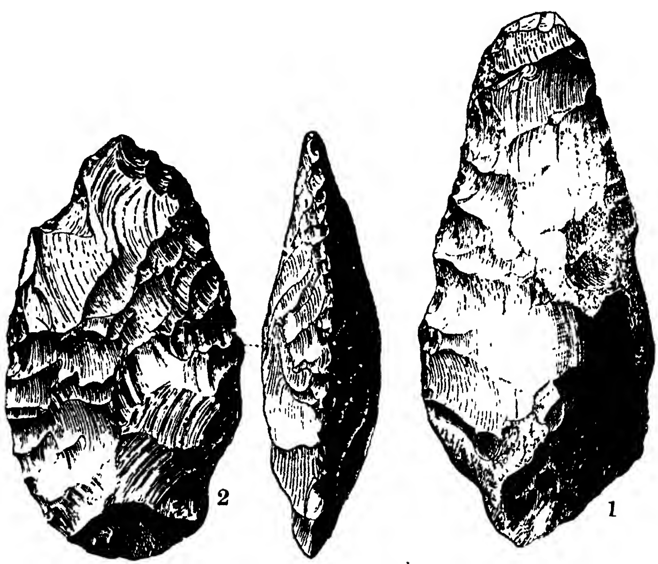


FIG. 63.—(1) A Chellean boucher; (2) a "limande" seen from the side and in front. From St. Acheul. (After Commont, *L'Anthropologie*. × ⅓.)

very different environment, destitute of ferocious carnivora and of colossal animals like the elephant. It has been urged, however, that the Chellean boucher was too thick to be comfortably hafted, and that when secured in its place, by cord or animal sinews, it would have been almost concealed in its wrappings, and have presented a very clumsy appearance. It would have made a deadly weapon all the same. And it need not have been so very clumsy: there are stone axes still

in use at the present day which present much the same proportions as the boucher—some are larger, and yet are nicely fitted with a haft. In New Guinea the root end of a bamboo is used; it is perforated transversely and the axe-head is wedged into the hole. A neater plan, and one more commonly used, is to bend double a

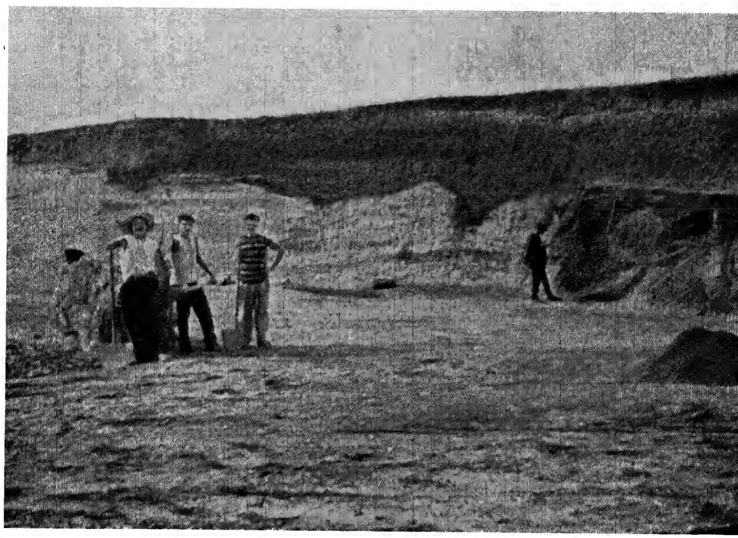


FIG 64.—Gravel pit (Carrière Thoux) near Chelles-sur-Marne. The Chellean industry, with a "warm" fauna, is found in the greyish-white gravel at the base. The succeeding darker coloured gravel, which "ravines" the lower, contains Acheulean implements below and Mousterian at the summit, both with a "cold" fauna. (After Obermaier.)

tough strip of wood and, after inserting the axe-head at the looped end, to secure it by a ligature which is bound tightly round the two apposed halves of the strip immediately below the head. Mr. Henry Balfour is convinced that the boucher was mounted in some such way.

M. Commont, however, not only repudiates all notion of a haft, but asserts that the boucher could not have

been used for striking heavy blows, for if so it would show signs of violent use, and this is never the case; the chipping which has been produced by wear being very minute. That the boucher was intended to fit the hand is plainly shown, according to the same distinguished observer, by its workmanship; a flake has been struck off on one side to make a place for the thumb and on the other for the fingers. Boucher de Perthes made a similar observation.


1

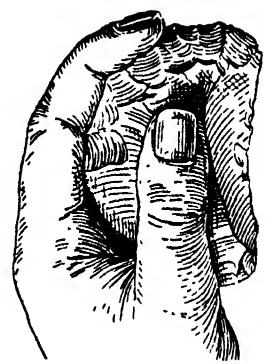

2

FIG. 65.—(1) Chellean scraper; (2) the same, showing how it was held in the hand. From St. Acheul. (After Commont, *L'Anthropologie*. × ⅓.)

The finest examples of the boucher are made of flint; with less tractable material, such as quartzite, the result is extremely crude.

The boucher has been said to occur unaccompanied by other implements; and according to G. de Mortillet this is the case at the famous locality of Chelles on the banks of the Marne (Seine-et-Marne) (Fig. 64), where abundant examples of the boucher have been found without, it is said, any admixture of other forms. Hence it has been supposed that the boucher was the one and

only implement of Chellean man.[1] This, however, can no longer be maintained; even at Chelles itself rough forms of other implements have been found, and at several other localities, notably at St. Acheul, well-defined end-scrapers, thick side-scrapers (Fig. 65), and notched scrapers, little pointed forms for piercing, and coarse knives are common associates of the boucher. M. Rutot describes in addition a dagger (Fig. 66), recalling that of Strépy, but dressed all over, haft as well as blade, and of superior workmanship; he also mentions flint lance-heads and arrow-heads.[2]

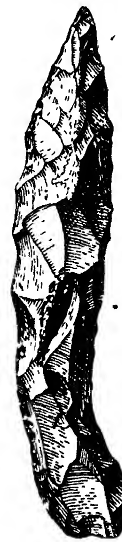


Fig. 66.—Flint dagger from Binche, Belgium: said to be Chellean, but possibly Neolithic. (After Rutot. × ½.)

The Chellean implements occur most commonly in river gravels, though some examples are known from caves, as in the famous Kent's Hole, near Torquay, which has yielded rough bouchers of an unusual type (Fig. 67, 1) from the lowest layer, along with teeth of the cave-bear.

As regards the geographical distribution of the Chellean industry, the characteristic boucher is found in all the continents of the Old World. It is spread over the whole of France, and all that part of England which lay south of the region of most persistent glaciation (Fig. 68). While rare in the north of Italy,

[1] "L'outillage de l'homme Chelléan était bien simple, il ne se composait que d'un seul instrument en pierre, le coup de poing"; G. de Mortillet, *Bull. Soc. d'Anthr.*, Paris, 1887, 3 sér. x, p. 173.

[2] A Rutot, *Le Préhistorique dans l'Europe Centrale*, 1914, p. 157. Engerrand, *Six Leçons de Préhistoire*, Brussels, 1905. H. Obermaier discredits both these and the daggers: *Mitth. d. prahistorischen Kom. d. K. Ak. Wiss.*, Wien, ii, 1908; so does M. Déchelette, *Manuel d'Archéologie préhistorique*, 1908, p. 65. The late Sir John Evans and G. de Mortillet also expressed their disbelief in the genuineness of the daggers. If genuine it is doubtful whether they are Chellean: Prof. Breuil regards them as Neolithic.

it becomes abundant as we go south. A few examples have been found in Portugal, and the industry is widely distributed over Spain, extending from Santander on

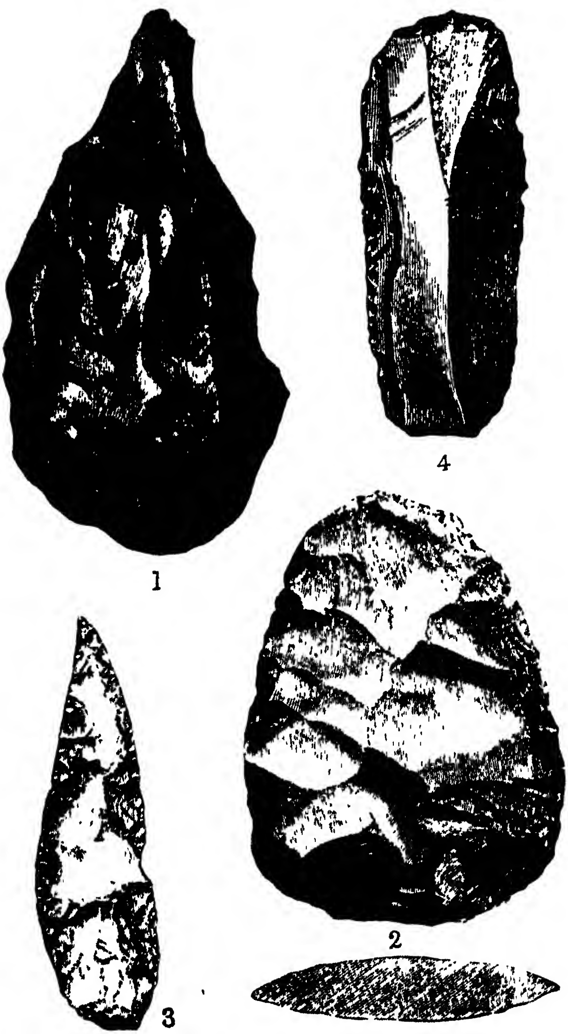


FIG. 67.—Various flint implements from Kent's Hole. (1) A boucher; (2) an Acheulean "limande"; (3) a Solutrean point; (4) a Magdalenian flake. (After Sir John Evans. × ½, except (4), which is natural size.)

the north to Cadiz in the extreme south. San Isidro near Madrid and Torralba in Soria are famous localities. In the latter numerous tusks of an ancient variety of *Elephas antiquus* were found along with it.

It has been traced from end to end of Africa, from

FIG. 68.—Map showing the distribution of the Lower Palæolithic industry in Europe.

Egypt through the Congo, Rhodesia, and the Transvaal to the Cape; and from west to east of southern Asia, from Arabia, Palestine, the valleys of the Tigris and Euphrates, to the Narbadda valley in Hindustan—where it is represented by quartzite implements which occur in company with extinct species of elephant (*E. namadicus*,

which appears to be identical with *E. antiquus*), and *Stegodon insignis* and two species of hippopotamus—and, again, still more to the east in Cochin China and Malacca.

In North America it is said to occur, associated with two species of extinct elephants (*E. Columbi* and *E. Jacksoni*), in some parts of Canada and the United States, but the fact is disputed.[1]

It is necessary to proceed with great caution in drawing inferences from this fact.

In the first place, the Chellean industry cannot be identified with Chellean man; that is, we have no reason to assume that even at this early date the human family was homogeneous, *i.e.* not yet differentiated into divergent races. General considerations would indeed suggest the contrary.

In the next place, we cannot identify the Chellean industry with a Chellean epoch. The Chellean industry probably originated at some particular centre and then travelled in a slowly enlarging wave to its outermost limits; it is even possible that fresh industries had already arisen while this wave was in progress, and that these were similarly propagated, so that after a sufficient interval of time all the various Palæolithic industries might have existed simultaneously in different parts of the earth.

It may be pointed out in illustration of this, that at the time we were living in an age of iron [2] a large part of mankind was still using implements of polished stone, and the Tasmanians implements which resemble the Mousterian and are certainly Palæolithic.

The duration of each of the several epochs may be

[1] Prof. Boule, however, affirms that implements identical with European palæoliths occur at Trenton, New Jersey. *L'Anthr.*, ix, p. 55, 1898.

[2] The present age is sometimes distinguished as the Age of Steel.

defined on the one hand by its first appearance, and on the other by the first appearance of that next succeeding it. Thus with the advent of the Acheulean in any locality, the Chellean epoch may be regarded as closed; nevertheless the Chellean industry may have continued to exist elsewhere, a fact which may be expressed by the statement that the Chellean industry survived into Acheulean or even later times. Thus the industries overlap the epochs.

These remarks imply a standard of comparison which Europe, or more particularly France, seems best fitted to provide. The pressing task of the anthropologist is to determine the true order of succession of the different industries in an appropriate area. This once established the next and more difficult step will be to refer the industries of other lands to it. This is the method of the geologist: it simplifies nomenclature and renders it more exact.

The Chellean Fauna.—This will naturally have differed in different parts of the world, and even in Europe geographical provinces may have existed. In France it has for long been recognised that the fauna which accompanies the boucher at Chelles is distinguished by the presence of *Elephas antiquus* and the absence of the mammoth (*E. primigenius*). As an almost inseparable companion of *E. antiquus* we find also the soft-nosed rhinoceros (*R. Mercki*), and among other distinctive animals we may mention the hippopotamus. These are all southern forms indicative of a warm climate.

In Belgium and England the case appeared to be different, since, in addition to the animals just mentioned, the fauna of a later stage, in particular the mammoth and the woolly rhinoceros (*R. tichorhinus*), were said to occur. Such an admixture, however,

always seemed improbable, and on re-investigation it is found that the apparent association of the two faunas rested on imperfect observation. Wherever the facts have been accurately ascertained the "warm" fauna alone accompanies the Chellean industry.

In Italy the fauna of the mammoth is unknown, at all events south of Piedmont, but the fauna of *E. antiquus* is both richly represented and very persistent, surviving into the Mousterian stage.

Attention may be called to the fact that the horse which is represented at Chelles itself is said to be allied to *Equus stenonis*.[1]

Of man, the most important member of the fauna, we will speak after briefly indicating the distribution of the Chellean age in time.

We have already seen that at Amiens (St. Acheul) the typical Chellean occurs in the lower gravels of the second terrace, which corresponds with the 30 metres beaches of the Tyrrhenian age. It is the same at Abbeville, further down the Somme, where Boucher de Perthes fought his great battle; at Chelles-sur-Marne, from which the industry takes its name, and at La Celle-sous-Moret on the Seine.

In Belgium and England the same horizon can be traced. M. Rutot [2] finds it in the valleys of the Meuse, the Haine and of the Lys, near Ypres, always at the same level and in the same relative position to the horizon of other industries above and below it.

In the Valley of the Thames, at Handborough, a little north of Oxford, the second terrace of 30 metres affords the usual Chellean fauna,[3] and further down at Caver-

[1] Choquet, *Matériaux pour l'histoire de l'homme*, 1881, p. 331.

[2] A Rutot, "Le Quaternaire de la Belgique et la Classification de V. Commont . . ." *Bull. Soc. Belge de Géol.*, tom. xxix, pp. 151–196, 1919.

[3] J. S. Sandford, "The River-Gravels of the Oxford District," *Proc. Geol. Soc.*, 1923, p. 100.

sham, near Reading, the typical Chellean implements which occur there in great numbers and variety, including the characteristic ficrons; still lower down at Barnfield, near Swanscombe,[1] not far from the mouth of the Thames (Fig. 69), we meet with it again—and again with numerous bouchers. Thus so far as research has yet proceeded it has provided consistent and convincing evidence by which we may safely refer the Chellean industry to the Lower Tyrrhenian age, and indeed to that particular horizon which is defined by the 30 metres terrace.

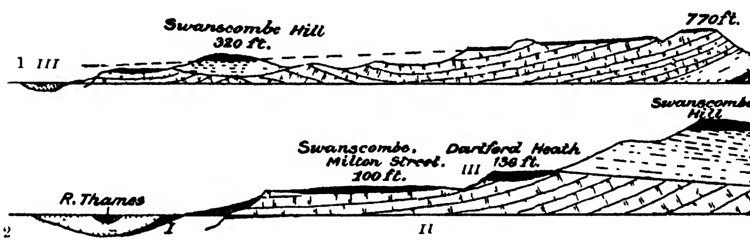


FIG. 69.—1. Section from Terry's Lodge (marked 770 feet), near Ightham, across the valley of the Thames. Distance about 12 miles. 2. Part of the above section on a larger scale. Distance about 3 miles. I. First terrace with Crayford brick-earth extending below buried river channel. II. Second terrace with Chellean implements in river gravel. III. Third terrace. In both sections the vertical scale is six times the horizontal. (After Hinton and Kennard.)

Chellean man.—We have already pointed out that even in these early times the human family was probably not homogeneous, but may have included more than one race or species (footnote, ed. 1, p. 120, 1911). We have now every reason to believe that this was really the case, for it would appear that two different species, referable to two different genera, were in simultaneous existence during the Chellean age.

The first of these to be discovered is represented by the famous Mauer jaw.

[1] R. A. Smith and H. Dewey, "Stratification at Swanscombe," *Archæologia*, 1913, lxiv, pp. 177–204.

Homo Heidelbergensis.—Towards the end of 1907 the late Dr. Schoetensack [1] found at Mauer, 10 kilometres south-east of Heidelberg, the beautifully-preserved lower

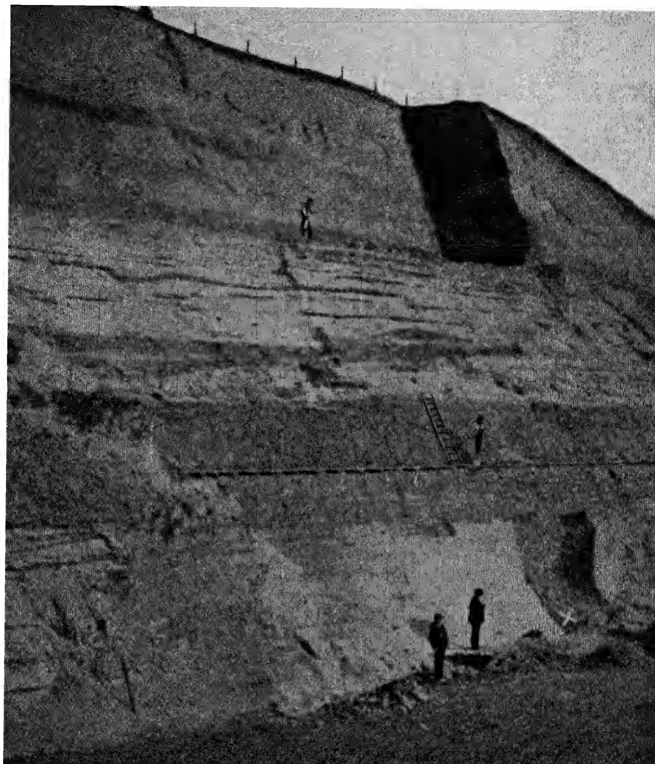


FIG. 70.—Position in which the mandible was found, Mauer, near Heidelberg. *a* to summit, Upper löss; *a* to *b*, Lower löss. All below *b*, Mauer sands, with an intercalated bed of clay; *c* to top of ladder *x*, the place of the lower jaw (after Schoetensack).

jaw of a primitive man, representing, as he rightly inferred, a new species, which he named *Homo Heidel-*

[1] O. Schoetensack, "Der Unterkiefer des *Homo Heidelbergensis* aus den Sanden von Mauer, bei Heidelberg," Leipzig, 1908. 4to.

bergensis.[1] It was extracted from a bed of fluviatile sand (Mauer sands), exposed in a sand-pit, at a depth of 24 metres (say about 80 ft.) below the surface of the ground (Fig. 70), and it is evidently of great antiquity.

Overlying the Mauer sands are beds of the younger and older löss,[2] as shown in the following table:

Younger löss	.	5·74 metres	(over 18 ft.).
Older „ .	.	5·18 „	(about 17 „).
Mauer sands .	.	15·62 „	(„ 51 „).

The jaw of the Heidelberg man is not the only fossil which has been dug out of the Mauer sands; a number of others have been obtained, sufficient to give us a fair idea of the contemporary life, and to suggest, with some approach to the truth, the geological age of the deposit.

The fauna includes two elephants (one *Elephas trogotherii*, the other *E. antiquus*), which were more closely allied to the existing African than to the existing Indian form. They roamed the plains of Europe in numerous herds, and continued to exist into times considerably later than the Mauer sands. There was a rhinoceros, *R. etruscus* (precursor of *R. Mercki*), a species which is found elsewhere in Upper Pliocene deposits, as in the Val d'Arno, Italy: it also occurs in the forest-bed at Cromer, and the Siwalik hills of India. Two species of bears are represented: a little bear (*Ursus avernensis*, Croizet, which resembles *U. etruscus*) and a big bear (*U. Deningeri*, Reichenau), the forerunner of the cave bear (*U. spelæus*); the lion (*Felis leo* var. *spelæa*, a species not distinct from the existing African lion which survived up to

[1] Prof. Guido Bonarelli thinks it is generically different and names it *Palæanthropus Heidelbergensis*. *Rivista Italiana de Palæontologia*, 1909, vol. xv, p. 26.

[2] For an account of the löss, see p. 144 *et seq.*

historic times in Southern Europe); a leopard (*F. pardus* sp.); the wild cat (*F. catus ferus*); a dog (*Canis neschersensis*, Croizet) which is almost identical with the existing wolf of the Pyrenees; a boar (*Sus scrofa*, cf. *prisca*); several deer (*Cervus latifrons*, *C. elaphus*, var.; *C. capreolus* var.); a bison [1]; the beaver (*Castor fiber*); and the horse. The horse is represented by a number of teeth, which are referred to a new species *Equus mosbachensis*, intermediate between the existing species (*E. caballus*), and the Pliocene *E. stenonis*.

This is evidently an old fauna, and as evidently a "warm" fauna which flourished during one of the genial intervals of the Pleistocene epoch. Those geologists [2] who are the best acquainted with the Mauer sands were inclined originally to refer it to the first of these intervals; but Prof. Boule,[3] one of the first authorities on the Pleistocene mammals, placed it later, remarking that it reproduces in minute details the characters of the fauna of Chelles in the valley of the Seine, and Prof. Rutot [4] had no hesitation in assigning the Mauer sands to the horizon in Belgium which he names Mafflian, and this now turns out to be of the same age as the Chellean.

The stratigraphical evidence confirms this conclusion. The Mauer sands form a continuous conformable series

[1] A small form with twisted short horns, belonging to the same race as occurs at Mosbach and Taubach. It was a forest animal: a long-horned contemporary race inhabited the steppe (Sörgel).

[2] W. v. Reichenau, "Beitrage z. Kenntnis der Carnivora aus den Sanden von Mauer und Mossbach," *Abh. d. Gr. Hess. geol. Landesanstalt*, IV, 1906. A. Sauer, "Exkursion in die Mauer Sande," etc., *Ber. u. d. Versammlungen des Oberrheinischen geologischen Vereins*, 14 April. 1909, pp. 25–32. W. Freudenberg, "Parallel-Ausflug ins Quartär von Weinheim a. d. Bergstr.," *ibid.* pp. 37–39.

[3] M. Boule, "L'Homme fossile de la Chapelle-aux-Saints," *Annales de Paléontologie*, Paris, 1911–1913, 273 pp., 15 pls., in particular p. 214, and *Les Hommes fossiles*, 1923, p. 151.

[4] A. Rutot, "Note sur la Mâchoire humaine de Mauer," *Bull. Soc. de Géologie Belge*, 1909, t. 22, pp. 117–69, in particular p. 129.

which passes upwards without interruption into the overlying ancient löss (Upper Tyrrhenian). They may therefore be referred to the period immediately preceding this löss, *i.e.* the Lower Tyrrhenian. Further than this, they form the base of the 32 metres terrace of the

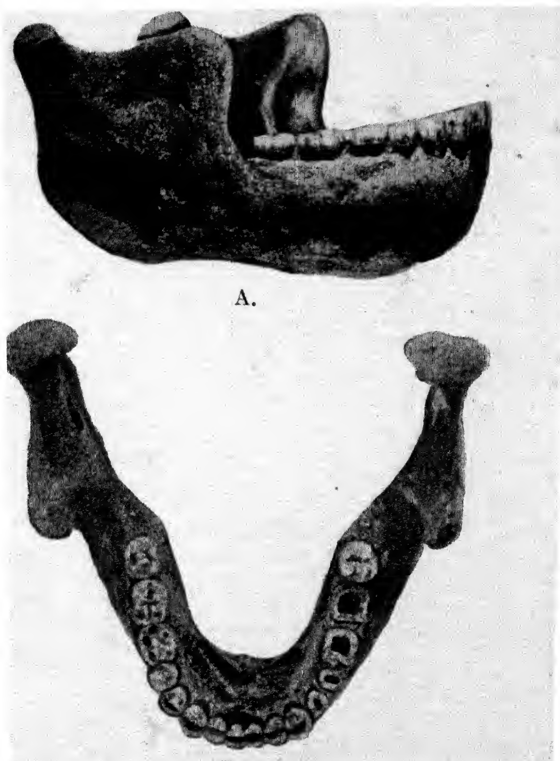


Fig. 71.—*A*, Mandible seen from the side; *B*, mandible seen from above.

Neckar, and are thus on the same horizon as the Chellean industry.

The Heidelberg jaw is thus identified with a race of Chellean men.

Let us now turn to the jaw itself (Fig. 71). It presents a combination of characters which are truly remarkable.

The dentition is completely human, the teeth forming a close, regular series uninterrupted by a gap (diastema), with the crowns all rising to a common level; the canines are no more projecting than the other teeth, and we may add, as an equally important fact, that the incisors are of a comparatively small size, no larger than the average of existing men. In the anthropoid apes these teeth are distinguished by their relatively large dimensions. *The dentition is in some respects less simian*

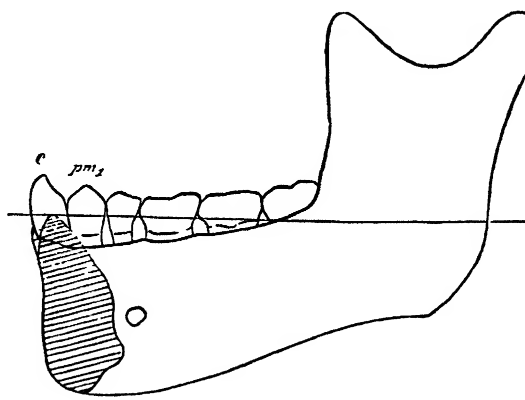


Fig. 72.—Lower jaw of an Australian man to show the projecting canine. (× $\frac{2}{3}$.)

than that which may be sometimes observed in existing primitive races, such, for instance, as the Australians (Fig. 72).

The front teeth are not "projecting," but set squarely in the jaw; they are curved, however, especially the roots, in accordance with the generally rounded contour of the front end of the jaw—precisely recalling, in this respect, the curvature of the teeth in the upper jaw of the Neandertal race as represented by the Gibraltar skull to which we shall refer later. They show considerable signs of wear, much more so than the back teeth (molars and premolars); and since the dentition

is complete, the wisdom teeth having been "cut," this shows that the front teeth probably played an even more important part than in the primitive hunting races of our own times.

An additional inference may be drawn from this fact. In the apes the third molar is cut before the permanent canine, or at latest simultaneously with it: hence, as Dr. F. Siffre[1] points out, if the jaw had belonged to an ape the third molar should have been as much worn as the canine; the fact that it is not furnishes, therefore, additional confirmation of the human character of the dentition.

If the characters of the dentition are purely human, the same cannot be said of the jaw itself, which offers a startling contrast. Dr. Schoetensack scarcely exaggerates when he remarks that, if the jaw had been found without the teeth, it might have been assigned, by some anatomists at least, to an ape.[2] Its massive body and broad ascending branches at once distinguish it, even to the uninstructed eye, from that of existing men; it stands, indeed, almost midway between that of *Homo sapiens* and that of an anthropoid ape, such as the chimpanzee.

The differences between a human and a simian jaw are most salient at the anterior extremity. In existing men the profile of this part of the lower jaw is usually, though not always, a more or less sigmoidal curve, concave above, just below the teeth, and convex below where it follows the chin (Fig. 72). The chin is a characteristic human feature. A line drawn from the upper to the lower extremity of the curve is more or less

[1] F. Siffre, "Apropos de la mandibule *Homo Heidelbergensis*," *Bull. Soc. Anthrop.*, Paris, 1909, ser. 5, x, p. 89.

[2] How fortunate it is that the teeth and jaw were not dissociated will be appreciated when we pass to the consideration of Eoanthropus.

vertical, varying a few degrees on one side or other of a perpendicular let fall from the upper extremity when the general alveolar surface of the jaw is placed horizontally.

In the mandible of the apes there is no inflexion below the incisors and there is no chin; the profile is a simple rapidly retreating curve.

It has long been known, from observations on the jaws of Spy and Krapina, that the chin was very much

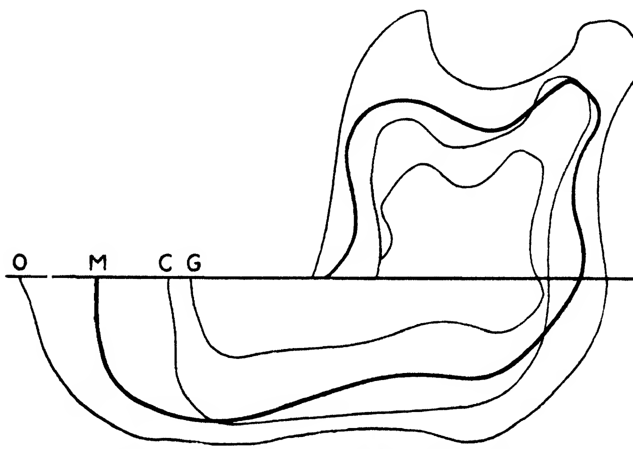


FIG. 73.—Projections of the Mauer jaw (M), the jaw of an orang-outan (O), of a native of New Caledonia (C), and of a gibbon (G). Superposed on the alveolar line. C. after Prof. Arthur Thomson. (× ½ about.)

reduced or even altogether absent in the Neandertal species; in the Heidelberg jaw, however, not only is this the case, but the profile has retained the simple rounded outline which is met with in the apes, differing chiefly by its more gradually retreating slope (Fig. 74).

The inner face of the anterior extremity of the jaw also presents several interesting peculiarities. In modern races this surface slopes steeply downwards from the back of the incisors and exhibits no marked subdivision into different regions. In the anthropoids its slope is far less steep, and the upper portion corre-

sponding to the lingual basin can generally be distinguished from the remainder, either by its gentler inclination or by presenting a concave instead of a convex outline in profile. In regard to this character also the Heidelberg jaw occupies an intermediate position, a somewhat sudden increase in inclination marking the termination of the lingual region (Fig. 74). The interval between the higher races and the Heidelberg jaw in

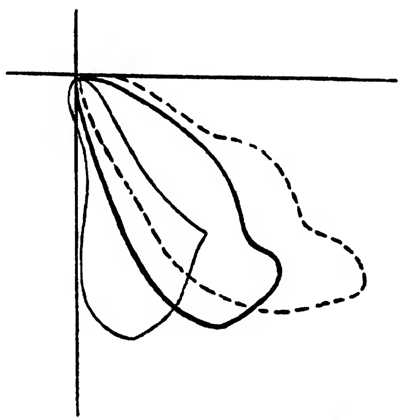


FIG. 74.—Sagittal section through the symphysis of the lower jaw of Mauer (thick line), an Australian aborigine (thin line), and a chimpanzee (broken line). (Natural size.)

respect to this character is filled, however, by an almost infinite series of gradations.

A second important peculiarity is presented by the lower part of the inner surface, about two-thirds of the way down. In existing races of men two pairs of muscles are attached in this region, the genio-glossal above and the genio-hyoid below; each muscle of the pair is symmetrically placed on each side of the middle line and close to it; in some cases the place of attachment is marked by a roughened oval area, but usually, in modern races, by a spine (*spina mentalis interna*), or spines. Great importance was given to this spine by de Mortillet,

who regarded it as essential to speech, a view which, though it has been refuted by Topinard, frequently recurs in the works of later writers. It is not infrequently absent from the jaw of the Bushmen, a people no whit less talkative than the rest of mankind, and capable of conversing in English or other languages as widely different from their own.

In the apes this spine is absent, and in its place we find a depression or pit. This simian character is now admitted, after much controversy, to occur in several primitive lower jaws of ancient date, but in none of them is it so conspicuous as in the Heidelberg example (Fig. 74).

Thus we perceive that in all the characters which distinguish the anterior extremity of the lower jaw, *Homo Heidelbergensis* stands midway between man and the anthropoid apes.

In its robustness and general characters it is equally primitive. The extraordinary breadth of the ascending ramus is a remarkable feature, implying great muscular development and a large zygomatic arch.

The jaw as seen from below is represented in outline in Fig. 75, and similar outlines of the lower jaw of an Australian native and of an orang, as well as of a young gorilla, are added for comparison. The jaw of the young gorilla is especially interesting, since it possesses a rudimentary chin, which it loses with growth.

Eoanthropus Dawsoni.—We have seen how the Mauer jaw unites the teeth of a man with the jaw of an ape; we are now to discover another anomaly of the same kind. In recent years Mr. Charles Dawson [1] has collected from

[1] Charles Dawson and A. Smith Woodward, "On the Discovery of a Palæolithic Skull and Mandible in a Flint-bearing Gravel overlying the Wealden (Hastings Beds) at Piltdown, Fletching, Sussex," with an appendix by G. Elliot Smith, *Quart. Journ. Geol. Soc.*, 1913, lxix, pp. 117–151, 4 pls.

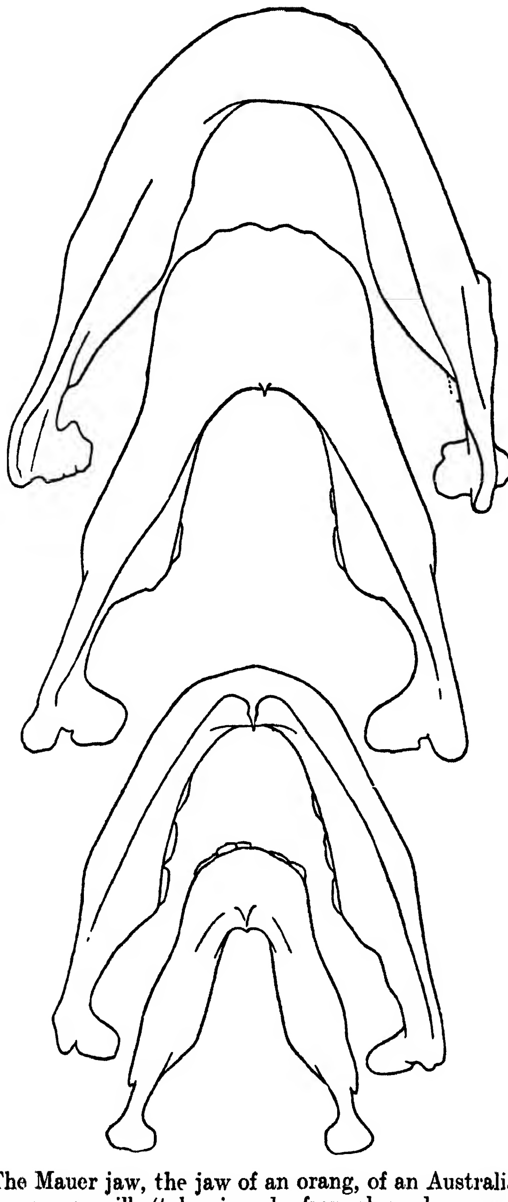


FIG. 75.—The Mauer jaw, the jaw of an orang, of an Australian aborigine, and of a young gorilla (taken in order from above downwards) seen from below, the alveolar plane being in all cases horizontal. (× ½ about.)

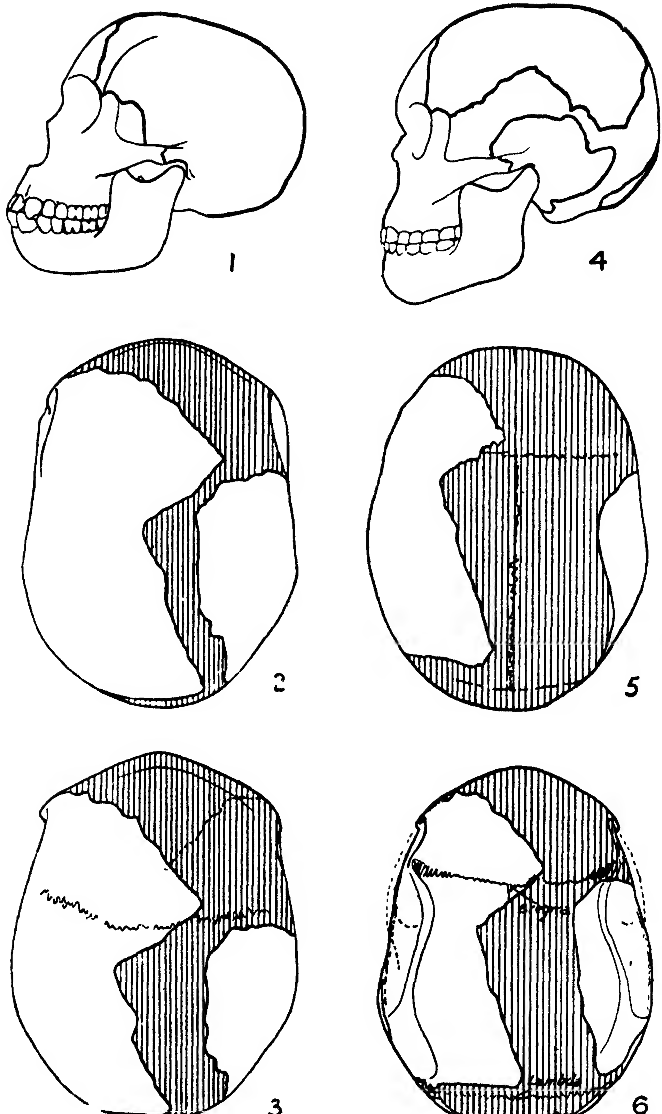


FIG. 76.—Successive Restorations of the Piltdown Skull. 1, Profile; 2, view from above of Smith Woodward's first attempt; 4, profile; 5, view from above of Keith's first attempt; 3, final reconstruction by Smith Woodward; 6, final reconstruction by Keith.

time to time fragments of a human brain-case as well as part of a lower jaw from plateau gravel belonging to the 30-metre terrace of the Ouse at Piltdown, near Fletching in Sussex, and for a full and admirable account of these remains we are indebted to Dr. Smith Woodward. They include the greater part of the frontal, parietal, occipital

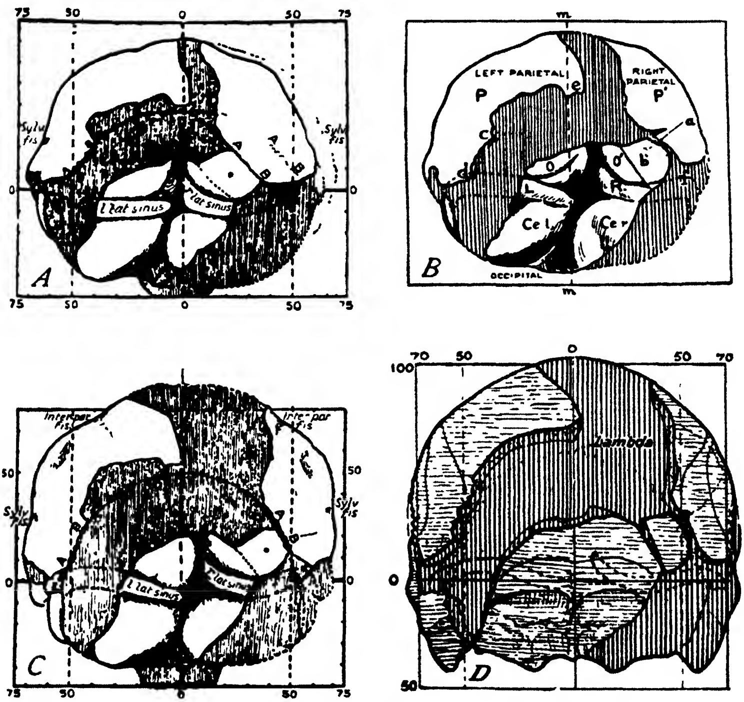


FIG. 77.—Restorations of Piltdown Skull. Seen from behind. A, first; B, final reconstruction by Smith Woodward; C, first; D, final reconstruction by Keith.

and temporal bones, sufficiently complete to render possible a reconstruction of the skull, a task which was undertaken by Dr. Smith Woodward and accomplished with great success.

A passing reference must be made here to a rival restoration, constructed by Sir Arthur Keith, which he subsequently abandoned for another (Figs. 76, 77). The

controversy[1] which accompanied these restorations led to renewed investigation and to the discovery by Prof. G. Elliot Smith of the anterior termination of the sagittal suture which enabled him to determine the position of the middle line of the skull with greater precision.[2] The result was to establish the general truth of Dr. Smith Woodward's restoration, but it rendered necessary some slight modifications, which were introduced into his second restoration (Figs. 76, 77).

The forehead as given in the reconstruction (Fig. 78, 1) is narrow but not markedly receding, and there is no indication of great brow ridges or a frontal torus, such as we shall meet with later in the Mousterian skull (Fig. 110, p. 228).

In the occipital region, otherwise very primitive, the external inion lies below the upper boundary of the tentorium, and in this character, as in the forehead, it resembles existing men rather than the extinct Mousterians.

The nasion angle as determined from Smith Woodward's restoration (Fig. 79) measures −6°, a value seldom approached by existing man. I have only once met with an angle of between −5° and −6°, and that was in an exceptionally low Australian skull, having a cranial capacity of only 1190 c.c.

[1] Sir A. Keith, "Ape-Man or Modern Man," *Illustrated London News*, vol. cxliii, Aug. 23, 1913; *ibid.*, *Nature*, vol. xcii, pp. 197, 292, 345, 624, 1913. G. Elliot Smith, *Nature*, vol. xcii. pp. 131, 267, 318, 468, 545; vol. xciii, p. 300, 1914; "Primitive Man," *Proc. British Academy*, vol. vii.

[2] Sir A. Keith (*The Antiquity of Man*, London, 1915, pp. 380, 381) seems to have fallen into a very curious error in his attempt to establish a base line for his second restoration. He remarks, "There is a reliable method of telling whether the external angular process is situated as in anthropoids or men. In the English skull the trend of the fronto-malar suture is backwards and upwards. In the anthropoid . . . the fronto-malar suture descends almost vertically." A very cursory examination is sufficient to show that in many human skulls belonging to different races this suture descends steeply and that in many anthropoid skulls it is horizontal.

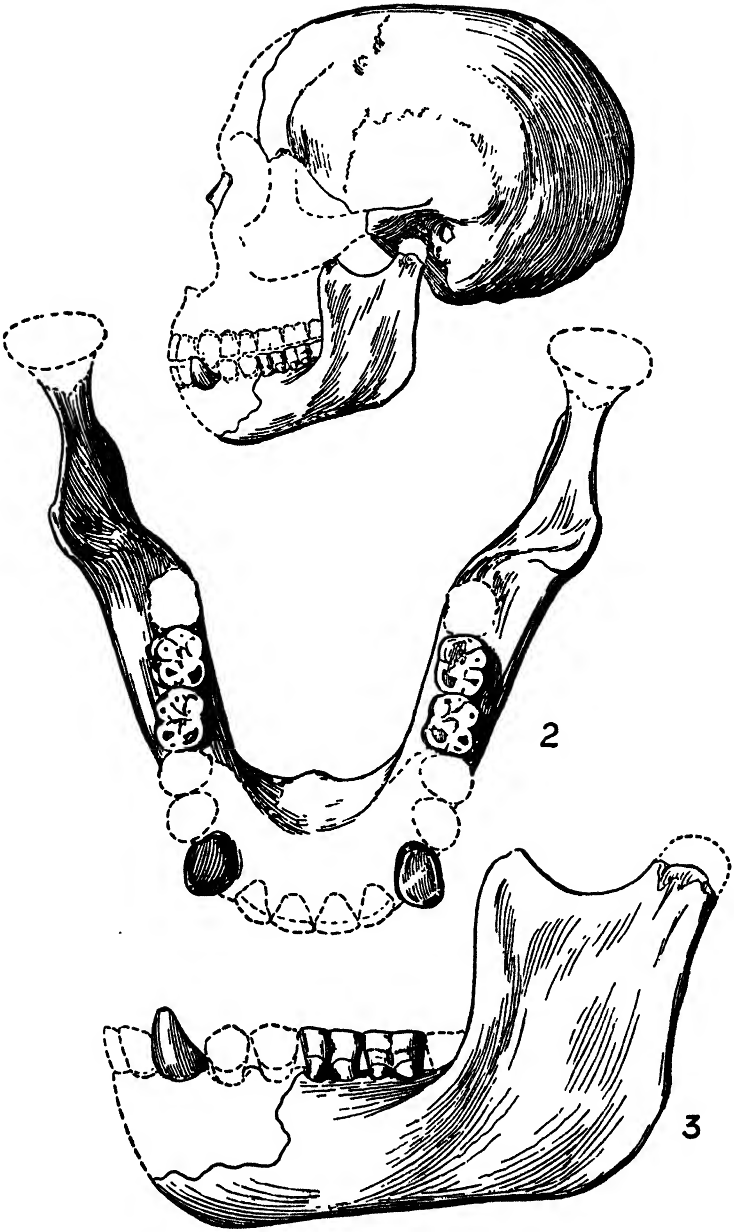


FIG. 78.—*Eoanthropus Dawsoni* (Woodward). 1. Skull and lower jaw restored (× about $\frac{1}{3}$); 2, lower jaw seen from above, and 3, from the side, in both restored (× about $\frac{2}{3}$). (After Smith Woodward.)

The cranial capacity, so far as can be ascertained from the reconstruction, is about 1300 c.c.

The brain, as represented by an internal cast of the skull, has been studied by Prof. G. Elliot Smith, who states that it presents more primitive and more ape-like features than any human brain he has hitherto examined.

It may be mentioned in passing that the bones of the

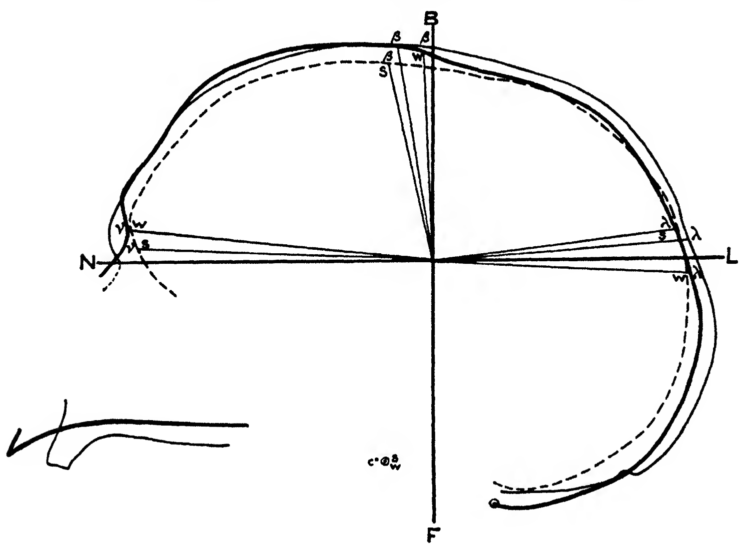


FIG. 79.—Sagittal sections of the Piltdown Skull as reconstructed by Smith Woodward (thick line, W W) and G. Elliot Smith (broken line, S S) compared with that of Combe Capelle (thin line).

skull are very thick, about twice as thick as in modern Europeans; this is a character frequently met in primitive skulls.

The brain case, although it presents many archaic characters, is truly human, but this cannot be said of the lower jaw, which is as distinctly simian. The feature which especially distinguishes it from the Heidelberg and all other human jaws is the presence of a nearly horizontal shelf or flange which extends

inwards from the lower margin, commencing as far back as the region of the second molar and continuing forwards as far as the jaw is preserved. This is precisely the same feature as occurs in the lower jaw of the apes, where the flange is continued forward with increasing development till it reaches the symphysis. It is not merely in this feature, however, but in all the minor details of its anatomy as well, that the lower jaw makes a nearer approach to the apes than to man.

So nearly does all that is preserved of the lower jaw, *i.e.* the greater part of its right half, resemble the corresponding part of the lower jaw of a young chimpanzee that, in attempting its reconstruction, Dr. Smith Woodward has felt justified in taking the jaw of that ape as a model. This has led him to complete the broken anterior end by a curved-surface which rises only very gently upwards so that the upper margin bearing the teeth is continued forwards in a truly apelike fashion, and there is no chin (Fig. 78, 3). To match this elongated lower jaw there must have been a correspondingly elongated upper jaw and thus we arrive at a very prognathous face.

When finally it comes to introducing the teeth—of which only the first and second molars [1] are preserved—these, and especially the canines, must be made of large dimensions. As the canine teeth were missing their place was at first supplied by hypothesis. Subsequently, however, Father P. Teilhard, while assisting Mr. Dawson in further excavations at Piltdown, discovered the canine

[1] These are nearly as long, but not so broad, as the corresponding teeth in the Heidelberg jaw, as will be seen from the following :—

	m_1 length	m_1 breadth	m_2 length	m_2 breadth
Piltdown	11·5 mm.	9·5 mm.	12·0 mm.	10 mm.
Heidelberg	11·6 ,,	11·2 ,,	12·7 ,,	12 ,,

A radiograph of the Piltdown jaw shows, according to Professor A. S. Underwood, that the third molar had been cut. It is probable that the individual to which it belonged was at least thirty years old.

tooth which was once rooted in the right half of the lower jaw. It agrees in a remarkable manner with the tooth inserted in the restoration, differing only in being a little smaller, more pointed, and less obliquely inclined. It is ape-like in shape, and, as shown by its worn face (Fig. 80), ape-like in the manner in which it worked against the canine of the upper jaw. Thus, Dr.

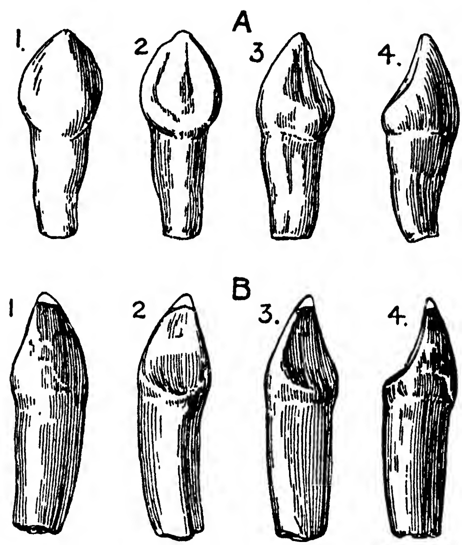


Fig. 80 —Right lower canine of Eoanthropus (B) and corresponding milk canine of *Homo sapiens* (A), slightly enlarged for comparison. (1) Outer, (2) inner, (3) anterior, (4) posterior views.

Smith Woodward's method receives an unexpected and triumphant vindication.[1]

The strange creature who thus combined a human brain case with an ape's jaw cannot be included in the genus Homo, and a new genus (Eoanthropus) has therefore been created to receive it.

[1] *Vide* "Note on the Piltdown Man," *Geol. Mag.*, 1913, Dec. 5, vol. x, p. 433, Pl. XV; see also C. Dawson, A. S. Woodward, and G. E. Smith, "Supplementary Note, etc.," *Quart. Journ. Geol. Soc.*, 1914, lxx, p. 82 *et seq.*

Some have regarded such a being as an improbable monster and have suggested that the jaw may not have belonged to the skull, but to a true ape. The chances against this are, however, so overwhelming that the conjecture might be dismissed as unworthy of serious consideration.

Here, however, we must enter upon a digression, for the suggestion thus summarily dismissed has since received the distinguished support of my friend Prof. Boule [1] and has been strongly advocated by an American naturalist, Mr. Gerrit S. Miller, jun.,[2] who, as a result of a painstaking study, distinguished by its wealth of detail, was led to assert very positively that the Piltdown jaw not only resembles, but actually is the jaw of a chimpanzee, to which he gave the name of *Pan vetus*.

This led to its renewed investigation by Mr. W. P. Pycraft [3] of the British Museum, who subjected Mr. Miller's arguments to a masterly analysis and ruthlessly tore them to pieces one by one. At the same time he called attention to some important characters presented by the jaw which are definitely not simian but human.

As a consequence, Profs. Osborn, Matthews and McGregor, who had previously been much impressed by Mr. Miller's observations, took the opportunity when they last visited Europe to make a special pilgrimage to the British Museum in order that they might see and handle the actual bones themselves of the Piltdown man, previously known to them only as represented by plaster

[1] Marcellin Boule, *Les Hommes Fossiles*, Paris, 1921, p. 166 *et seq.* In the second edition of this work (1923, p. 173) Prof. Boule, while admitting that some additional facts which have come to light since 1921 lend additional support to Dr. Smith Woodward's views, still maintains a sceptical attitude.

[2] Gerrit S. Miller, jun., "The Jaw of the Piltdown Man," *Smithsonian Miscellaneous Collections*, vol. lxv, No. 12, 31 pages, 5 pls., 1915.

[3] W. P. Pycraft, "The Jaw of the Piltdown Man, a Reply to Mr. Gerrit S. Miller," *Science Progress*, N.S., vol. xi, 1916–1917, p. 389 *et seq.*

casts. The result was eminently satisfactory, the doubts these observers had previously entertained were dissipated and they fully recognised that the jaw and skull had rightly been assigned to a single individual. A very handsome acknowledgment of this conclusion was published by Prof. Osborn,[1] and Prof. McGregor assured me that if they had seen the bones before, instead of the casts, the scepticism they had felt would never have arisen.

The surprise which was at first excited by what appeared to be a monstrous combination disappears on further reflection. Such a combination had, indeed, been long previously anticipated as an almost necessary stage in the course of human development. This will appear from the following quotation :—

"Given a strong ape-like animal with social instincts wresting his sustenance from the wild beasts of the plains and the evolutional path to man lies open. The erect attitude, the dexterous hand and the enhanced intelligence are not inconsistent with the possession of brute force and brutal characters, but once acquired they render possible another acquisition, and this of tremendous import. A pointed stick, and the notion of using it to thrust, and we have the primitive spear. Once armed with this the necessity for natural weapons disappears. The massive jaws and fighting teeth can now be dispensed with, and may safely undergo a retrogressive development with adaptation to purely alimentary functions." [2]

In *Eoanthropus Dawsoni* we seem to have realised

[1] H. F. Osborn, "The Dawn Man of Piltdown, Sussex," *Journ. American Mus. Nat. Hist.*, vol. xxi, p. 590, 1922.

[2] Anniversary Address to the Geological Society of London, *Quart. Journ. Geol. Soc.*, 1910, vol. lxvi, p. lxxxv. See also the admirable address to section H (Anthropology) by Prof. G. Elliot Smith, *Report British Association*, 1912, pp. 575–598.

precisely such a being as is here imagined, one, that is, which had already attained to human intelligence but had not yet wholly lost its ancestral jaws and fighting teeth.

The age of the gravels in which Eoanthropus was found may be determined with a fair amount of certainty.

Like much of the high-level gravel in the south-east of England, they are composed of the riddlings of many older strata, Wealden ironstone, chalk flints, Eocene

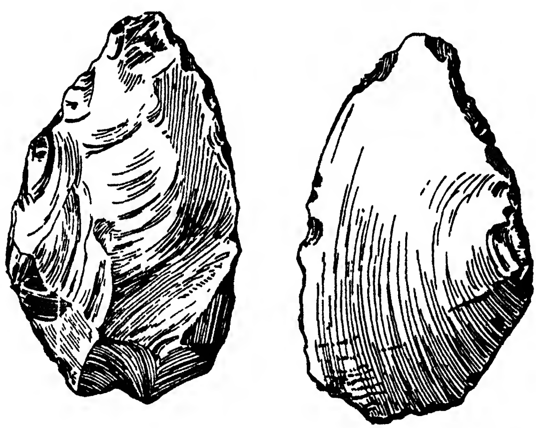


Fig. 81.—Flint implement, Piltdown. (After Smith Woodward. × $\frac{3}{8}$ about.)

pebbles, Sarsen-stones, and some brown flints resembling those of the Red Crag. Residues of the Red Crag seem to be rather plentiful in the New Forest and there is nothing very remarkable in the presence of Pliocene fossils, such as mastodon, stegodon and rhinoceros in the Piltdown gravel. These fossils can be readily distinguished from the later ones, such as hippopotamus, beaver, red deer and Eoanthropus itself, which agree in being less highly mineralised than the Pliocene derivatives and are contemporary with the deposition of the gravel. Hippopotamus points to a genial climate.

The gravel has yielded some flaked flints, one of which has been definitely recognised as an implement (Fig. 81); it bears some resemblance to the smaller implements of the Chellean industry.

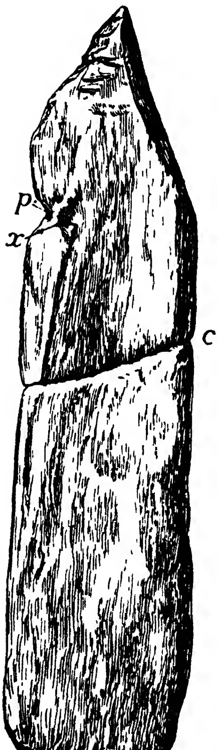


Fig. 82.—Bone implement, Piltdown. *c*. fracture produced by pressure of the gravel; *p*. remains of a perforation the outer boundary of which is broken off; *x*. beginning of another perforation. (After Smith Woodward. × ¼.)

But the most remarkable implement, fashioned in all probability by Eoanthropus himself, is a piece of bone (Fig. 82) which has been taken from the femur of some ancient species of elephant—not the mammoth, but a larger elephant, probably *E. antiquus*. It is a more or less flat slab, sixteen inches long by four inches wide and one to two inches thick. It is truncated at the base by transverse cuts which have been achieved with difficulty and at the other it is rudely cut into a sort of wedge. Its purpose is unknown, but, as Prof. Breuil remarks, the man who made it must have been accustomed to working in wood. Bone implements are not known elsewhere before the Mousterian period and do not become common till much later.

But the Piltdown bone is *sui generis*, no other Palæolithic age has produced anything like it.

The height of the gravels above the Ouse is 25 metres. They may therefore be assigned to the 30-metre terrace.

Thus the evidence points clearly to the Chellean or Lower Tyrrhenian age. This period, however, was a

very long one, so that it does not follow immediately that *Homo Heidelbergensis* and Eoanthropus were in existence at precisely the same time. Yet it is probable, for the terrace of 30 metres is not necessarily co-extensive with the whole of the Lower Tyrrhenian age, but may simply mark one particular episode in it.

The general uniformity of the Chellean industry stands in striking contrast to the divergent characters of the two species which to all appearance represent its artificers.

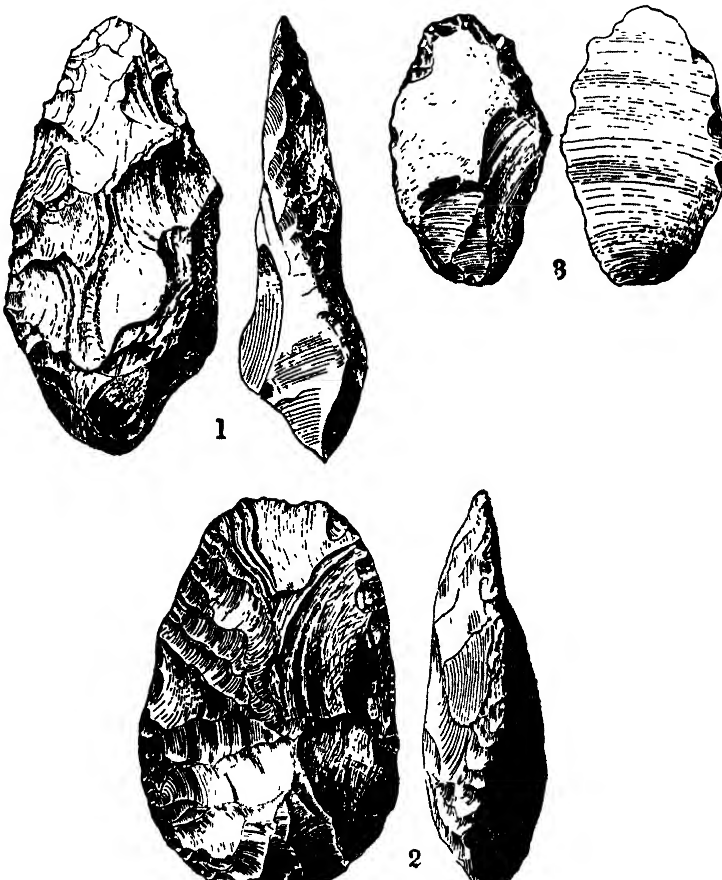
The Acheulean Stage.

The Acheulean industry is the direct descendant of the Chellean, and the boucher is still the characteristic implement, but it is a different boucher, distinguished by its finer workmanship and more elegant form. It is much flatter, not so thick, and consequently lighter; the flaking is not so coarse, and the edge has been worked by repeated retouches into an even, regular line, very different, when perfectly developed, from the jagged edge of the Chellean form (Fig. 62). It is thus rendered more trenchant, so that the Acheulean boucher is not only a better finished but a more efficient implement.

In the Lower Acheulean of St. Acheul the "ficrons" of the Chellean have already disappeared, and their place is taken by the ovate form already mentioned known as a "limande."

It may be observed that the edge of the Acheulean boucher is frequently not straight, but slightly twisted (Fig. 83), the twist, which affects indeed the whole implement, seems to have been produced intentionally. Nearly a half of the total number of bouchers collected at St. Acheul have it.

In the Upper Acheulean the boucher has acquired a fine lanceolate form, and is accompanied by a great variety of smaller implements.



1

3

2

FIG. 83.—Lower Acheulean implements from St. Acheul: 1, A typical boucher; 2, a "limande" or ovate boucher; 3, a scraper. (After Commont, *L'Anthropologie*. × ⅓.)

The distinction between the implements of the various stages in the Chellean and Acheulean series is not so great in fact as it appears on paper. It would be

impossible in many cases to say with certainty whether a particular boucher came from a Chellean or an Acheulean horizon. But when collections of implements taken from the various stages are compared together, the practised eye has little difficulty in discerning the differences.

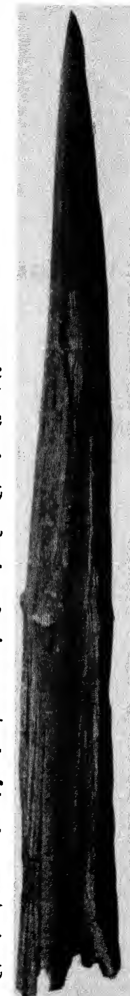


Fig. 85.—Point of a wooden Acheulean Spear. (After Hazzledine Warren. × ⅛.)

Each stage is transitional to the next, and there is a gradual passage from the Strepyan, with its rudimentary bouchers, up to the summit of the Acheulean with its finished "ovates."

Fig. 84.—Boucher of La Micoque. (× ⅓.)

From beginning to end of this evolutional series there is not, according to M. Commont, a single implement which can be regarded as a weapon. Thus we are reminded of the Tasmanians, with their spears made exclusively of wood.

Since this was written the pointed end of a veritable wooden Acheulean spear has been brought to light. It was discovered by Mr. Hazzledine Warren [1] in a bed containing remains of *Elephas antiquus* and a "Mesvinian" industry at Clacton-on-Sea (Fig. 85).

The Acheulean fauna was originally described as a mixed fauna, including both the southern forms characterised by *Elephas antiquus*, and

[1] S. Hazzledine Warren, *Quart. Journ. Geol. Soc.*, lxvii, 1911, *Proceedings*, p. xcix; *Essex Naturalist*, xvii, 1912, p. 15; *Prehist. Soc. E. Anglia*, III, 1922.

the northern, equally characterised by the mammoth, *E. primigenius* (Fig. 86). But more exact observation seems to show that this is only true when the Acheulean is considered as a whole. If we restrict our attention to the Lower Acheulean of the second terrace on the Somme, where it occurs in sands at the base of the lower derm, we find, according to M. Commont, only

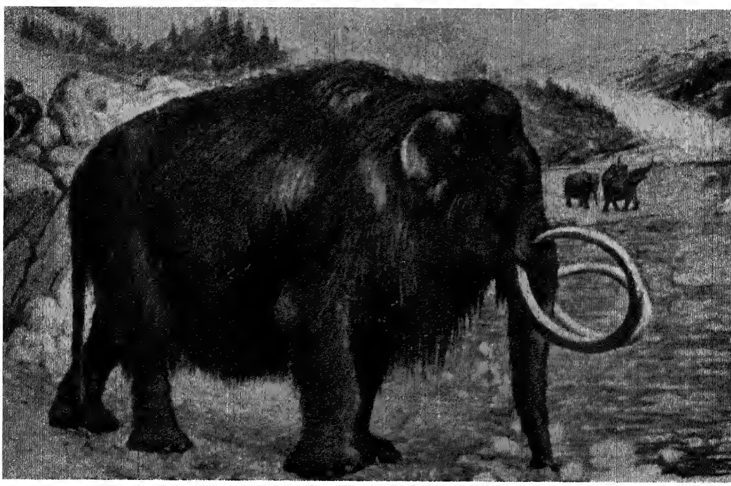


FIG. 86.—The mammoth (*Elephas primigenius*). (From Osborn, after C. R. Knight.)

the warm fauna as represented by *Elephas antiquus*, a large horse, a large bovine species, and the red deer together with some fresh-water shells — *Belgrandia marginata* and *Unio littoralis*. But in the Upper Acheulean, found in the lower derm itself (red, sandy loam), the warm fauna is diminishing and the cold fauna makes its appearance for the first time; it includes *Elephas primigenius*, *Rhinoceros tichorhinus*, a large

horse, a very large lion, the rabbit, and the red deer, but not the reindeer.[1]

The mammoth, as shown by Mr. Lydekker, was not larger than the existing species of elephant.[2] Its tusks,

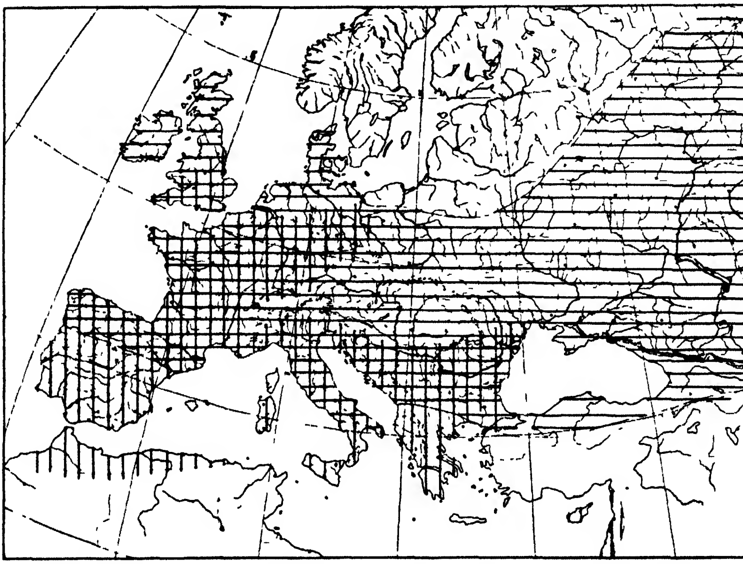


Fig. 87.—Distribution of *Elephas primigenius* (Mammoth), horizontal lines; and *E. antiquus*, vertical lines. (After Boule.)

large and strongly recurved, were sometimes as much as 23ft. in length. Its warm coat of close fur and long hair,[3] which was particularly long about the neck, where

[1] In the deposits of the first terrace, as we have seen, the lower löss is absent; notwithstanding this we might still expect to find the Acheulean in the fluviatile deposits overlying the late Chellean gravels; but we do not, we meet instead with a Mousterian industry of a peculiar character and, strange to say, associated with a warm fauna. (V. Commont, "Moustérien à faune chaude dans la vallée de la Somme à Montières-les-Amiens," *Congrès International d'Anthropologie*, 1912, Geneva, p. 291.) This interesting fact, once regarded as an anomaly, will be referred to again later.

[2] Hrdlicka (*Bureau Am. Eth.*, Bull. 33, 1907) gives the height of the mammoth, measured from the shoulder, as 2·9 m., of the African elephant 3·35 m.

[3] See Report of 6th International Zoological Congress, p. 76, for an account of a frozen mammoth discovered in Siberia in 1901.

it formed a kind of mane, no doubt served in the first place as a protection against the rigours of a cold climate;

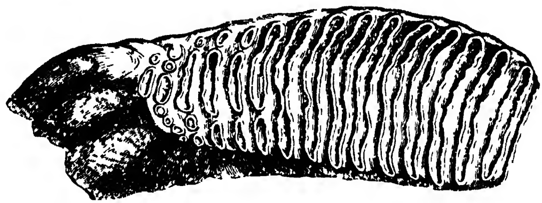


FIG. 88.—The mammoth (*Elephas primigenius*). Last molar but one, lower jaw, right side. (After Lyell. $\frac{1}{3}$.)

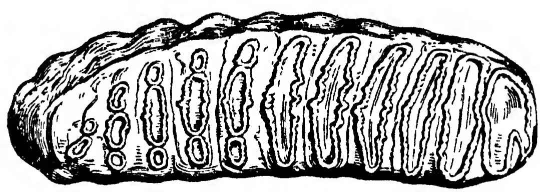


FIG. 89.—*Elephas antiquus*, Falconer. Last molar but one, lower jaw, right side. (After Lyell. $\times$ $\frac{1}{3}$.)

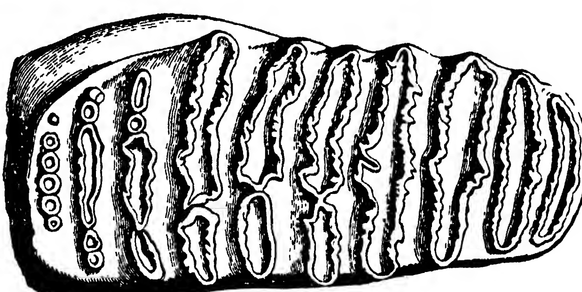


FIG. 90.—*Elephas meridionalis*, Nesti. Last molar but one, lower jaw, right side. From the Upper Pliocene. (After Lyell. $\times$ $\frac{1}{3}$.)[1].

[1] The three "classic" species of elephant represented by teeth in these figures were sufficient for the palæontology of the last century but no longer satisfy the requirements of more refined observation. Pohlig has created a new species, *E. trogontherii*—to receive forms intermediate between *E. meridionalis* and *E. primigenius*; Madame Pavlov has introduced another—*E. wusti*—between *E. trogontherii* and *E. meridionalis*, and M. Commont distinguishes two groups of *E. antiquus*: one, the original species, with narrower teeth and closer lamellæ; the other, which is also the older, with wider teeth and more open lamellæ. The typical *E. antiquus*

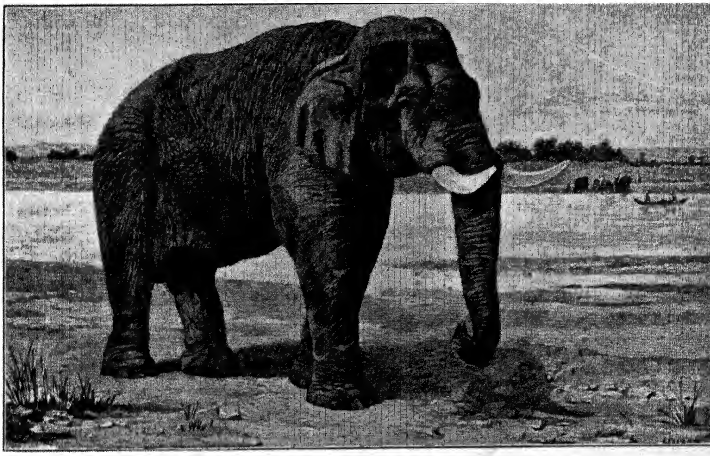


Fig. 91.—The Indian elephant. (From Beddard, after Sir Samuel Baker.)

Fig. 92.—The African elephant. (From Beddard, after Sir Samuel Baker.)

occurs in the first terrace of Chelles, the other in the second terrace of St Acheul. M. Commont correlates the structure of the teeth with the nature of the food; the *primigenius* type was adapted to coarse grasses, the *antiquus* type to the branches and foliage of trees.

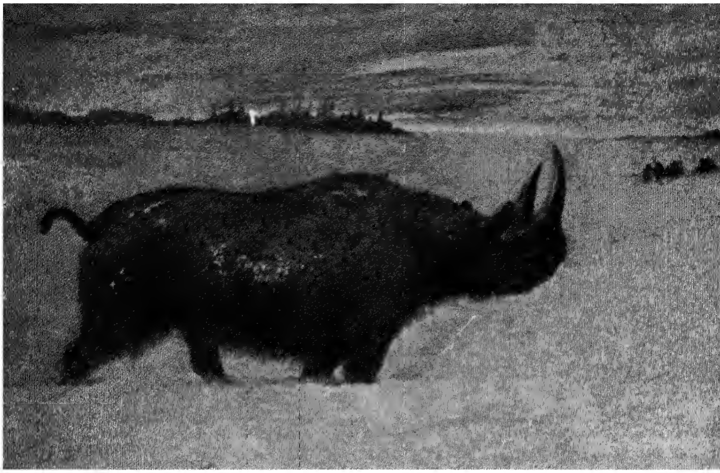


FIG. 93.—*Rhinoceros tichorhinus.* (From Osborn, after C. R. Knight.)

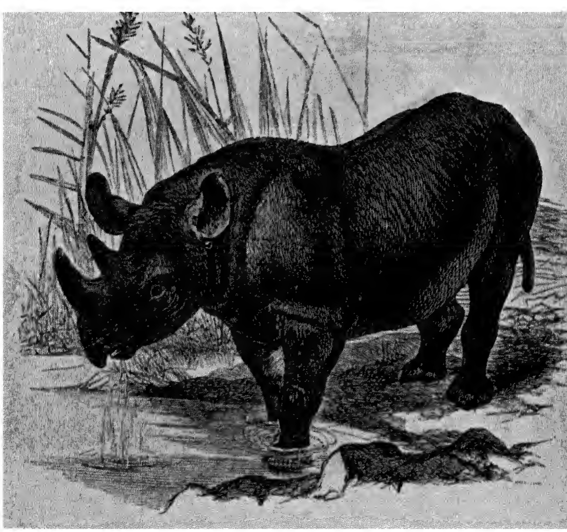


FIG. 94.—The two-horned African rhinoceros, for comparison with *R. tichorhinus.* (After Flower and Lydekker.)

a further protection was afforded by a layer of fat 9 cm. in thickness beneath the skin. The skin itself was 3 cm. in thickness, *i.e.* about twice as thick as in the existing elephant. Its ears were very small and densely haired. Its teeth, by which it is generally recognised in the fossil state, differ from those of *E. antiquus* by their greater breadth and more numerous transverse lamellæ; the

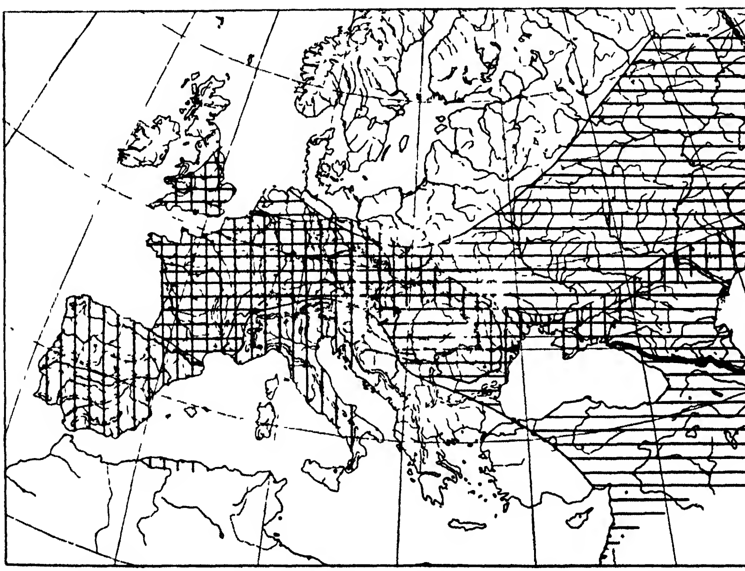


FIG. 95.—Distribution of *Rhinoceros tichorinus* (horizontal lines) and *R. Mercki* (vertical lines). (After Boule.)

lamellæ themselves are narrower and crowded closer together; the enamel on their surface is less coarsely folded (Fig. 88). This species was more nearly allied to the Indian (Fig. 91) than the African elephant (Fig. 92).

Its companion, the woolly rhinoceros (*R. tichorhinus*), was also well protected from the weather by a coat of fine wool and long hair (Fig. 93). The woolly rhinoceros was armed with two large horns, which stood one behind

the other over the nose; the larger sometimes reached a length of three feet. To carry the weight of this the septum between the nostrils was converted into bone, and this more complete ossification of the nasal septum is one of the features which distinguishes the woolly rhinoceros from *Rhinoceros* (*leptorhinus*) *Mercki*.

The Acheulean industry is rarely found in caves, but it occurs in the Grotte de Castillo very near the base of the cave deposit, and in association with a "warm" fauna.

At St. Acheul the Lower Acheulean with a "warm" fauna occurs on three horizons of the second terrace, the lowest in a layer of pebbles at the very base of the ancient löss. This layer of pebbles thickens out into a bed of shotter which "ravines" the underlying Chellean gravels.

The second and third horizons, also with warm faunas, lie within the lowest layer of the ancient löss, which is distinguished by Commont as the sandy löss. It owes its origin largely to rain-wash.

The upper Acheulean, with a "cold" fauna but no reindeer, is found in the uppermost layer of the ancient löss, and this not only at St. Acheul but also in the löss station of Achenheim in Alsace.

It is clear, therefore, that the Lower Acheulean is of Lower Tyrrhenian, and the Upper of Upper Tyrrhenian age.

CHAPTER VI

LOWER PALÆOLITHIC

Mousterian Age

So far we have only been able to follow the trail of Palæolithic man, extracting what information we could from the implements dropped along the way; now, as it were, we enter a clearing, where we make acquaintance with the man himself, witness his feasts around his hearth, and contemplate the last ceremonies which attended him to the grave.

Let us first examine his implements. A marked improvement may be observed in their design and workmanship. The boucher, which represents a natural nodule of flint, reduced by flaking to the required shape and size, has disappeared, or only survives in the earliest stages of the period. Its place is taken by the Levallois flake (Fig. 96, 3 and 4), the basis of which was not a whole nodule, but a flake struck off from it.

The method of making the Levallois flake has been elucidated by M. Commont,[1] who has discovered the very places where both the Acheulean and Mousterian hunters carried on their work.[2] At these spots, littered about over a limited area, lay the nodules of flint which furnished the raw material, the cores which remained after the flakes were struck off, the chips and splinters

[1] V. Commont, *Congr. préhist. de France*, Paris, 1910, pp. 115–157.
[2] Similar discoveries have been made in England by Mr. Flaxman Spurrell (*Arch. Journ.*, 1880, xxxvii, p. 294, pl. 1) and Mr. Worthington G. Smith (*Man, the Primæval Savage*, London, 1894, pp. 135–136).

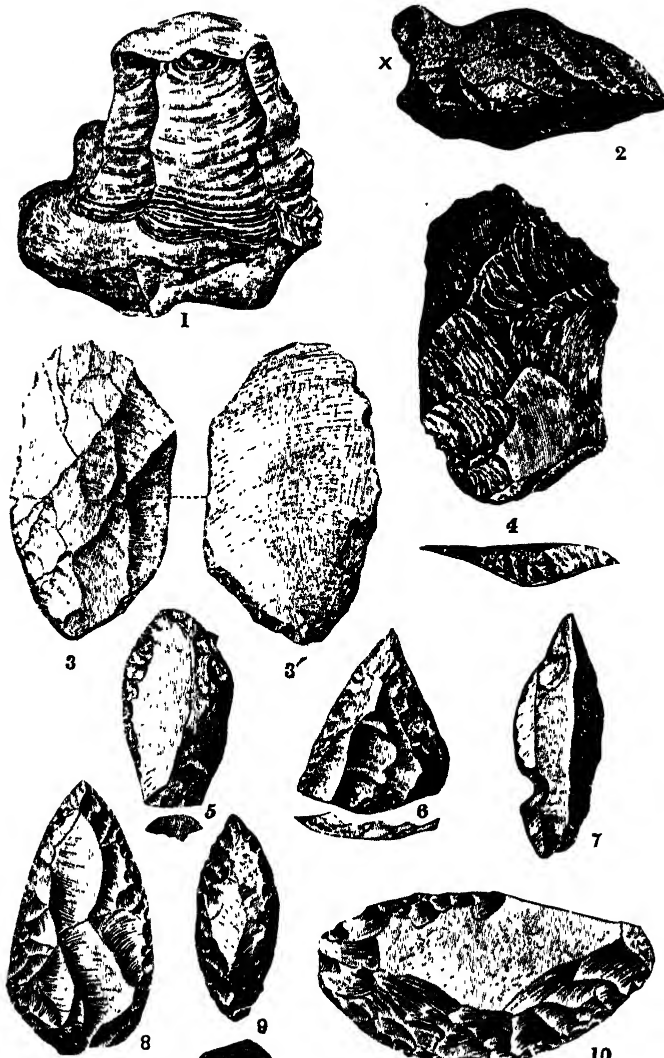


FIG. 96.—1, A flint core from which Acheulean flakes have been detached; 2, a nodule of flint prepared for obtaining a Levallois flake, which is struck off by a blow delivered at the point marked by a cross; 3, 3′ and 4, Levallois flakes; 5, an Acheulean flake; 6, a Mousterian point; 7, a Mousterian lance-head; 8 and 9, La Quina points; 10, a La Quina scraper. (1–7 after Commont; 8–10 after Obermaier. 1 × $\frac{2}{7}$; 2, 4, 5, 6, 7 × $\frac{1}{7}$; 3, 8, 9, 10 × $\frac{1}{3}$.)

detached in the process, and—still in the rough—the implements themselves. It was found possible to piece some of this material together, and when the original nodule was thus reconstituted the process of manufacture became clear.

The Acheuleans showed very little method in their work; if they wished to obtain serviceable flakes they selected a nodule of flint, and holding it in one hand struck it by means of a hammer-stone with the other; the blows, delivered to right and to left, were always directed obliquely, the nodule being turned round again and again as the worker searched for an appropriate face (Fig. 96, 1). The flakes thus obtained are short, thick, and irregular in form; but that which chiefly distinguishes them is their plane of fracture (Fig. 96, 5). The bulb of percussion is small, and frequently several cones of fracture occur near the same spot, showing that more than one blow had been required to detach the flake. The base of the flake is a plain surface, without any secondary working. In making a boucher, flakes were struck off in the same manner by oblique blows, one after another, till the nodule was reduced to the required shape and size. The flakes obtained as by-products could also be used, and little implements were made out of them which sometimes present a deceptive resemblance to some Mousterian forms.

The Mousterians began by dressing the nodule into an appropriate shape; all the corners were removed and one face was flaked over its whole extent: then with a single blow, directed perpendicularly (*aplomb*) on one side, a flake was detached by a fracture which traversed the prepared block through its whole thickness from side to side (Fig. 96, 2). The flake was then trimmed, its base (the end opposite the point) was roughly flaked into a polygonal outline, and sometimes

further dressed by finer chipping, which converted the polygonal into a rounded outline. Its thickness was sometimes reduced by flaking away the upper surface or by removing the bulb of percussion, which was very protuberant, from the opposite surface. Wherever the edge was too thin, or likely to break when used, it was retouched to render it less fragile.

Some of these flakes attained considerable dimensions; those described by M. Commont from the north of France were sometimes as much as 15 to 18 cm. in length.

The Levallöis flake was an advance upon the boucher in more ways than one; its design effected a saving of labour, since only one side required to be dressed, as well as a reduction in weight, and it produced also a sharper cutting edge. At the same time the improvement in design was accompanied by a greater mastery over technique.

The Mousterian point is a finer kind of Levallois flake, more symmetrical in shape, sometimes leaf-like, more usually triangular, and smaller in size, rarely exceeding 10 cm. in length (Fig. 96, 6). Its edges are carefully retouched and, like the pointed extremity, very sharp; it might have been used as a sort of universal tool for piercing, cutting, scraping, or sawing.

Another characteristic Mousterian implement is the side scraper, which was fashioned in a similar manner to the point, but with a different shape. It is not worked to a point, and the careful secondary flaking is sometimes, but not always, restricted to a single gently curved edge (Fig. 96, 10). Such an implement would be well adapted to scraping skins; it would also make an excellent saw, especially when the edges, as often happens, have been retouched by alternate chipping,

first on one side, then on the other. M. Commont has put one of these scrapers to the test and says that it took only a few moments to saw through a branch of green wood, but he does not give the thickness of the branch. The same instrument might well be used both for cutting up an animal and scraping its skin.

The usual assemblage of end scrapers, notched scrapers, and awls is met with here, as on other palæolithic horizons, but we also encounter, and that for the first time, forms which appear to be genuine weapons, such as the lance-heads described by M. Commont. One of them (Fig. 96, 7) is notched near the base, apparently for a ligature to secure it to a shaft.

At St. Acheul the lower part of the younger löss on the second terrace is divided into three beds, each with a layer of angular gravel at its base, and each of these layers provided M. Commont with Mousterian implements and the remains of the typical "cold" fauna. Thus he was naturally led to suppose that the whole succession of the Mousterian industries was represented by this series, and he distinguished the three layers as Upper, Middle and Lower Mousterian respectively.

Then came the discovery of Mousterian implements in strange association with a "warm" fauna, upon an horizon in the first terrace of the Somme (at Montières near Amiens) where we should have expected to find the Acheulean. This was certainly a disconcerting discovery, but such discoveries are always welcome to the genuine investigator, for when honestly faced they generally lead to an unexpected enlargement of our knowledge.

The immediate inference to be drawn in this case is that the Mousterian industry made its first appearance during a genial age, and as the succeeding stages of this

industry occur in the immediately succeeding beds of the younger löss (Upper Monastirian), this genial age must lie within the Lower Monastirian. In consistence with this we now know of several other localities where a "warm" Mousterian industry occurs, such as Taubach and Ehrensdorf near Weimar, Krapina in Croatia, Wildkirkli on the Santis, La Micoque, Laussel, La Terrasie and the Grimaldi caves in France.

If, as seems reasonable, we name this "warm" stage the Lower Mousterian then the "cold" stages which occur in the löss at St. Acheul may be classed together as Upper Mousterian and distinguished as the first, second and third zones of that sub-stage.

That we should find the Mousterian in the gravels of the first terrace, which we have regarded from the first as Monastirian, is just as it should be.

But there is a difficulty we have overlooked. Things are not so simple as they seem. We have passed over the position of the Chellean *évolué,* which is certainly Tyrrhenian, and yet occurs on the first terrace underlying the Mousterian. This is indeed an inconsistency and shows that we must not take the terraces at their "face value."

The explanation would seem to be as follows: Soon after the second terrace, with its typical Chellean industry, had been formed an elevation of the land must have occurred which enabled the Somme to deepen its valley down to the first terrace, where it remained long enough to cut out the step and deposit its gravel. All this within the Lower Tyrrhenian age. Then or soon after the land began to sink, the sea invaded the valley and extended as far up as Menchecourt, leaving there a deposit containing sea-shells as a witness of its presence. The Somme in consequence filled up the lower reaches

of its valley till it overflowed the first terrace, where it deposited its gravel with Mousterian implements over the already existing Chellean deposits.

To complete the story it may be added that after this the land rose again until the mouth of the Somme stood 28 m. above its present level. Over the gravels that it then deposited at its mouth a growth of peat took place in Neolithic times. The bottom of this peat, as discovered by a boring, now lies 28 m. below the existing sea-level, thus showing that the latest movement was a submergence of the land to this extent.

The later history of the Thames repeats that of the Somme. So, according to Prof. Marr, does the fen-land about March, near Cambridge.

The Lower Mousterian is typically represented at La Micoque near Les Eyzies, and at Levallois-Perret, near Paris. La Micoque, in addition to Levallois flakes and a various complement of smaller implements, includes a characteristic little boucher, lanceolate in form with one side steeper than the other, as is shown in the illustration (Fig. 84, p. 195), where the line of parting between the two sides lies to the left of the middle line and the left side is the steeper.

Dr. Obermaier[1] has included this stage in the Acheulean because the Levallois flakes make their appearance in company with these bouchers, but if, to follow a general rule, we are to date the commencement of an epoch from the first appearance of its characteristic industry, then Levallois and La Micoque should be assigned not to the Acheulean but to the Mousterian. That this is their true place has been recognised by Commont.[2]

[1] H. Obermaier, "Die Steingerate des Französichen Altpalaolithikums," *Mitth. pràhist. Kom. d. K. Ak. d. Wiss.*, Wien, 1908, ii, pp. 41–125.

[2] V. Commont, "L'industrie Moustérienne dans la région du Nord de la France," *Congr. préhist. de France*, Paris, 1910, pp. 115–157 (in particular pp. 130–132).

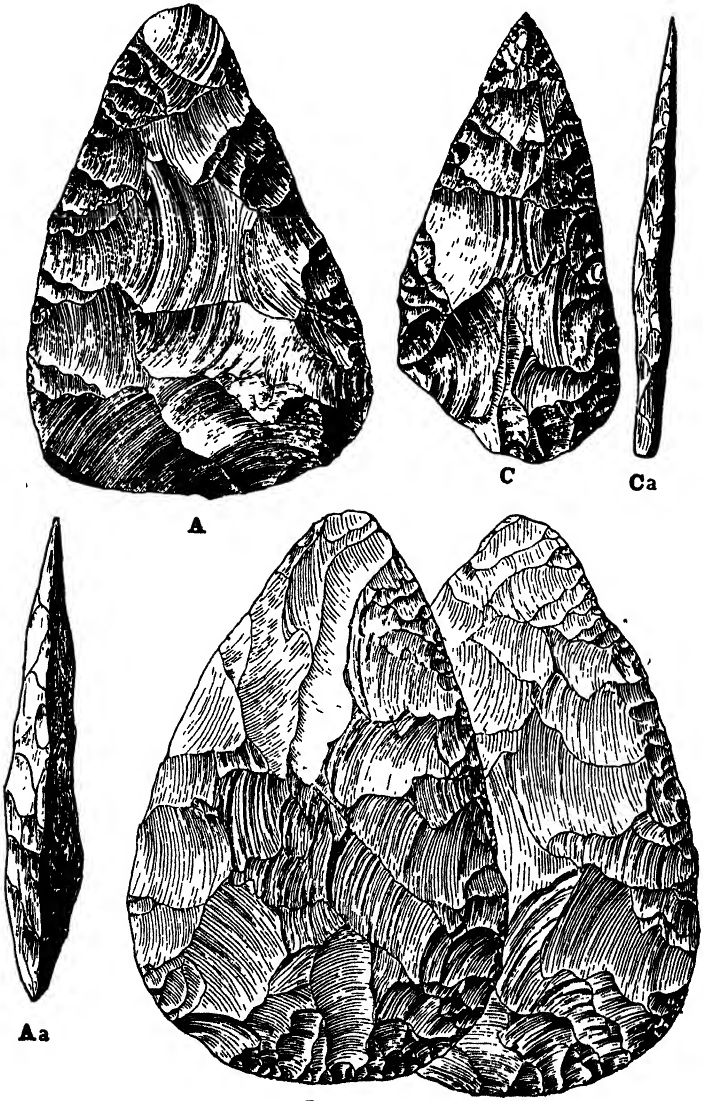


FIG. 97.—Lower Mousterian bouchers. A, A*a*, Triangular form; B, B*a*, Oval form; C, C*a*, Small highly-finished variety. (After Commont. × about $\frac{1}{2}$.)

The lowest zone of the Upper Mousterian also contains, in addition to the usual Mousterian implements, numerous bouchers,[1] which, however, differ from the Acheulean boucher by the flatness of one face. They are of various forms, often of large size, and skilfully worked. Some (Fig. 97 A) are triangular and almost equilateral in outline, all three sides being trenchant; others (Fig. 97 B) are oval and recall the Acheulean "limandes" except for the flat face, which, however, is finely worked all over.

Some of the smaller forms of these bouchers (Fig. 97 C), which seem rather inappropriately named, are among the masterpieces of Mousterian art: they are remarkable both for their beauty of form and the excellence of their retouch; according to M. Commont, they rival in fineness of workmanship the best examples of the Solutrean point, to which, according to some authors, they may have given rise.

With this lowest zone the boucher disappears from the valley of the Somme;[2] the middle zone is the division longest and best known, its implements are less finished than those of the upper zone, which attain a high degree of perfection. The upper zone is best represented at La Quina (Charente) where some points (Fig. 96, 8 and 9) occur which in the beauty of their workmanship are scarcely inferior to the small bouchers already mentioned above. At La Quina many (66) spherical balls of limestone, shaped by the hand of man, have been found.[3]

[1] V. Commont, "Le Moustérien ancien," 8me *Congrès préhist. de France;* Angoulême (1912), 1913, pp. 297–320.

[2] It is said to occur in the Upper Mousterian of Le Moustier; Bourton, *Congrès International d'Anthropologie*, Monaco, 1906, p. 287; and in the Aurignacian of Châtelperron and l'abri Audi; Breuil, *ibid.*, p. 320, and Ferrassie, Peyrony and Capitan.

[3] G. Chauvet, "Boules en pierre Moustériennes," *Congrès préhistorique de France*, Bordeaux, 1905, p. 188.

They range from 35 to 90 mm. in diameter and were used, it is supposed, as bolas. Some ingenuity would have been required in devising a means for attaching two or more of the balls to a cord, but a Mousterian who had conceived the idea of a bolas would no doubt be equal to this. A skin purse is an obvious device.

The choice of limestone for these implements would be very appropriate, for this is more easily worked than flint and has the advantage of possessing a higher specific gravity; its comparative softness would be no drawback. Some smaller, often irregular, sometimes disciform, flaked stones—flint in this case—are regarded as sling stones. They need not have been thrown by a thong; the Déné Indians use a branch, split into three at one end, as a stone thrower.

Dr. H. Martin [1] has pointed out that the bones found in the kitchen middens of La Quina bear many marks of the flint implements; scorings left by the saw, scratches by the scraper in taking off the meat, and cuts by the knife in disarticulating the joints. Bruised cuts on some of the bones seem to show that they were used as an anvil or chopping-block.

The distribution of the deposits containing a Mousterian industry in the valley of the Somme has been worked out in great detail by M. Commont. The results are represented in the following diagram (Fig. 98).

It was in the Mousterian age that man first [2] made his home in caves: the period takes its name indeed from the cave of Le Moustier in the valley of the Vézère, Dordogne, where its remains were first carefully studied. "Home" perhaps is not altogether an appropriate

[1] H. Martin, *Recherches sur l'Évolution du Moustérien de La Quina (Charente)*. Paris, fasc. 2, 1909, 180 pp., pls.; fasc. 2, 1910, 315 pp., pls.

[2] An interesting exception is afforded by the Lower Acheulean floor in the Grotte de Castillo.

term; the hunter is by the very condition of his existence a roaming animal, never remaining long in one place, so that the caves might have been only temporary shelters, primitive hunting lodges. Implements of earlier date, though not unknown in caves, are rare, while the Mousterian are common; fortunately they also occur in the löss and valley deposits of the open country so that we are now able to extend the field of our observations and to check the order of succession determined

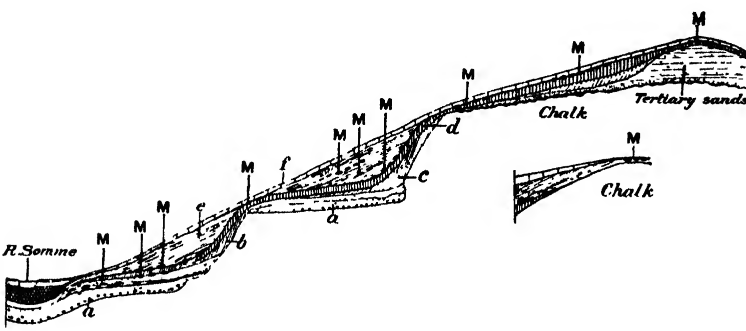


FIG. 98.—Section across the valley of the Somme to show the horizons on which Upper Mousterian implements are found. *a*, Lower gravel; *b*, *c*, rain-wash; *d*, limon fendillé; *e*, ergeron; *f*, brick-earth; M, Mousterian horizons. This section may be compared with that given in Fig. 56. (After Commont.)

from the one class of evidence with that obtained from the other.

The remains of the Mousterian age are widely distributed in the Old World south of the region then still covered by the ice (Fig. 99); they extend from Britain to the south of France, Spain, Italy, and northern Africa, and from the west of France through Germany to Moravia (Šipka and Čertova) and Russian Poland (Wierzchow) on the one hand, and to Croatia (Krapina), the Crimea and Asia Minor on the other.

The assemblage of animals which inhabited Europe

during the Upper Mousterian age was similar to that of the Upper Acheulean age, with the important addition of the reindeer, which now appears for the first time and continues through nearly the whole of the remaining Palæolithic period; it was the fauna of the reindeer and the mammoth.

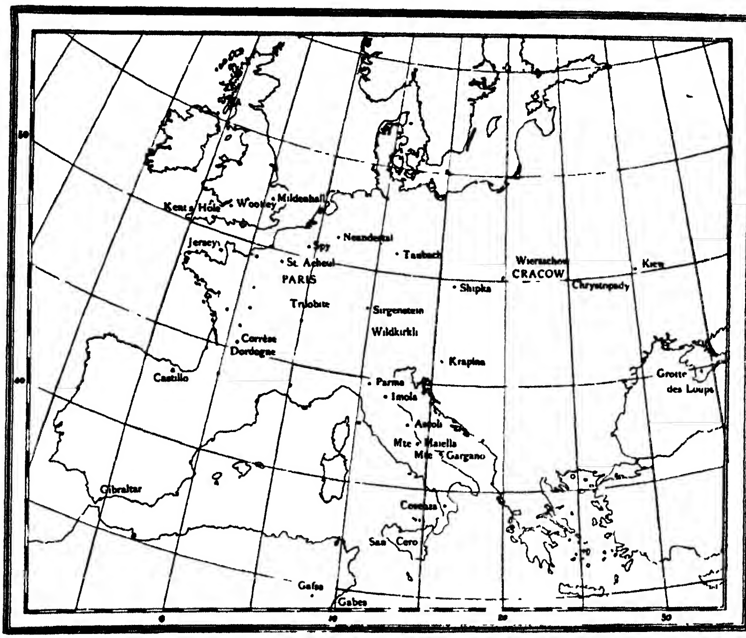


FIG. 99.—Distribution of Mousterian stations in Europe.

The fauna of the mammoth is often spoken of as the cold fauna, in contradistinction to that of *Elephas antiquus*, or the warm fauna. It is generally difficult to draw very precise inferences from fauna to climate; the mammoth itself was certainly well fitted to withstand cold, but it roamed over a very wide area; its range was possibly determined less by temperature than the distribution of the plants upon which it fed. The remains

of plants found in the stomach of the frozen mammoth discovered in 1901 included a species of Carex, *Thymus serpyllum*, *Papaver alpinum*, and *Ranunculus acris* var. *borealis*, all seed-bearing species, still existing in the Siberian tundra where the frozen remains of the mammoth are found.[1] The rhinoceros (*R. tichorhinus*), the common companion of the mammoth in Mousterian deposits, is also occasionally found preserved in the

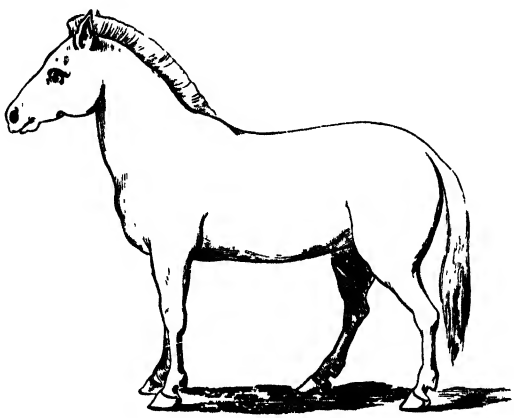


FIG. 100.—Przevalsky's wild horse.

ice of the tundra; less is known about its food, but in one of these frozen specimens pine needles are said to have been found between the teeth. The horse has been supposed to indicate extensive prairies, but Przevalsky's wild horse (Fig. 100), which appears to have existed in Upper Palæolithic times, now inhabits the great Dsungarian desert, between the Altai and Thian-Shan Mountains.[2] It is said to prefer the saline districts, and to be able to go a long time without water.

[1] A. Smith Woodward, "The New Mammoth at St. Petersburg," *Nature*, 1903, lviii, p. 297, and W. Salensky, *Mem. Imp. Ak. Sci. St. Petersburg*, 1903–5.

[2] *Nature*, 1884, xxx, p. 391 and p. 436. M. Boule is of opinion that it is not represented in Palæolithic deposits.

The bison, a favourite food of the Mousterians in the south of France, was widely distributed over Europe in early historical times, and it now survives in Lithuania; the American bison once roamed the prairies, providing a chief source of sustenance to the Red

FIG. 101.—The reindeer. (After F. E. Beddard.)

Indians, till its countless herds disappeared before the repeating rifle of the civilised hunter, who desired it for the price of its skin. Its bleached bones stand in heaps upon the plains.

But apart from these animals there were many others which are now found only in the colder regions of the globe; one of the best known is the reindeer (*Rangifer tarandus*) (Fig. 101), which is at present confined to the Arctic regions of both hemispheres; it flourishes best

in a cold, dry climate. In winter it finds shelter in the woods, and does not venture into the low, treeless plains except in summer.[1] Another cold-loving animal of the period was the musk ox (*Ovibos moschatus*) (Fig. 103) which now inhabits the Arctic parts of North America

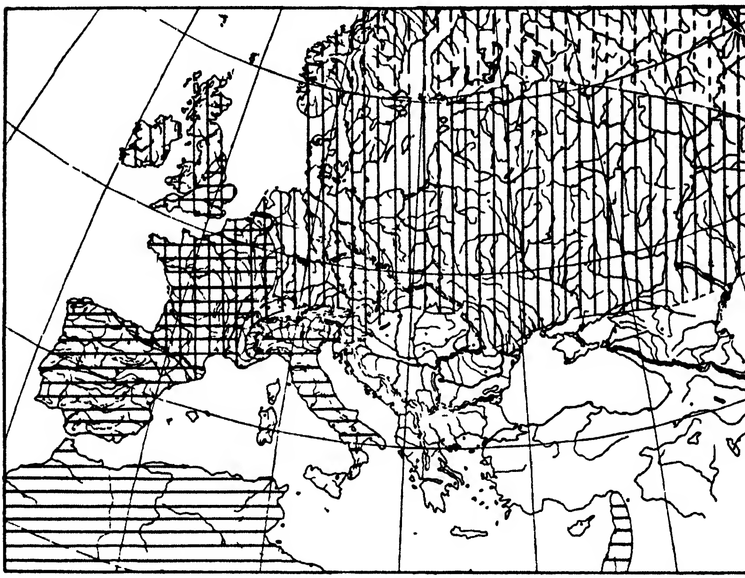


FIG. 102.—Distribution in the Palæolithic epoch of the hippopotamus (horizontal lines) and the reindeer (vertical lines). The broken lines mark the region still occupied by the reindeer in the Old World. (After Boule.)

and Greenland. Lieutenant Greely found it in Grinnel Land as far north as lat. 81½° N.

Of smaller cold-loving animals there was a great number, such as the Arctic fox (*Canis lagopus*) (Fig. 104), which inhabits the Arctic regions, including the island of Jan Mayen, and still survives in Norway; the glutton (*Gulo borealis*) (Fig. 105), widely distributed in the Arctic

[1] They are seeking food, not shelter, when they move into the woods, and it is food they are seeking when they leave them. Note by V. Stefansson.

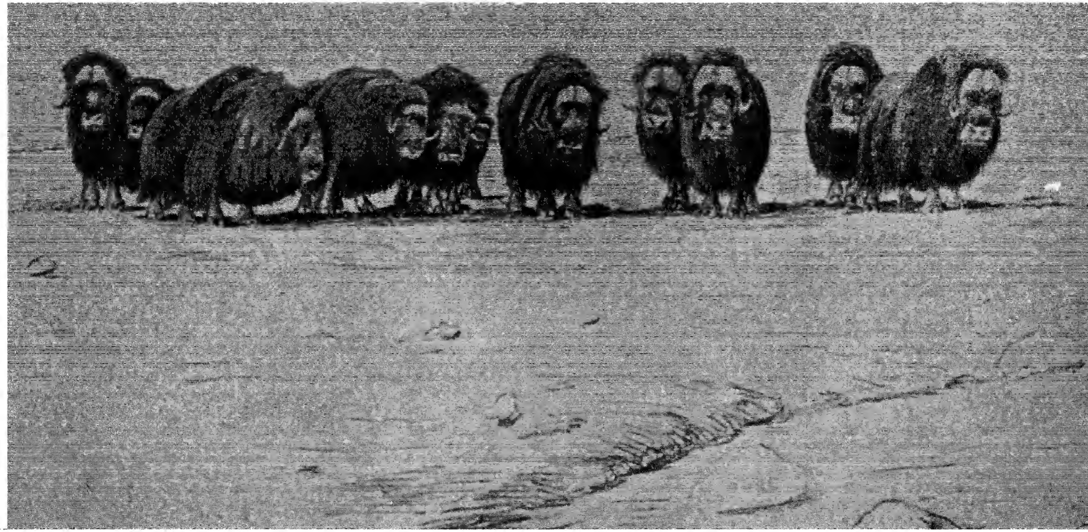


FIG. 103.—A herd of musk-oxen in East Greenland. The herd consists of seven bulls (an unusually large number), five cows and two calves: it has just stopped full of amazement at the unusual sight of man; foremost on the right is the chief bull, absolute monarch of his troop; tufts of winter's wool are hanging from his coat. The calves have been forced as far back as possible, out of harm's way. When an attack is imminent, as from wolves, the calves are placed in the middle, and the adults stand round with their backs to them, facing the foe.[1] (From a drawing by E. Ditlevsen, after a photograph by J. Madsen.)

[1] See Søren Jensen, "Mammals Observed on Andrup's Journey to East Greenland, 1898," *Meddelelser om Grønland*, 1909, xxix, pp. 44–53.

regions; the marmot (*Arctomys marmotta*) which lives in the higher region of the Alps, Pyrenees and Carpathians;

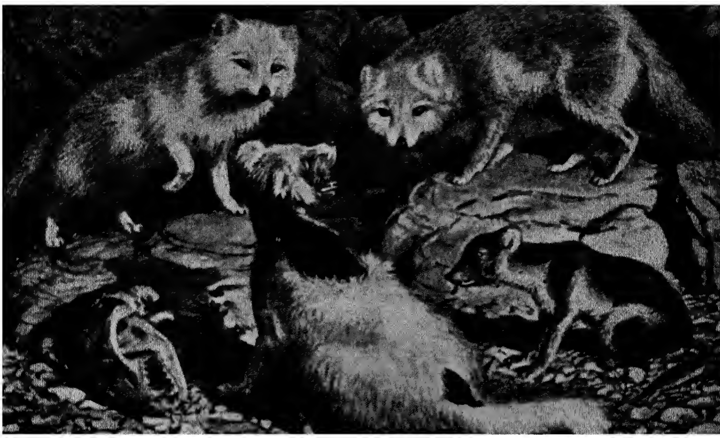


FIG. 104.—The Arctic fox, *Canis lagopus.* (After Manniche.)

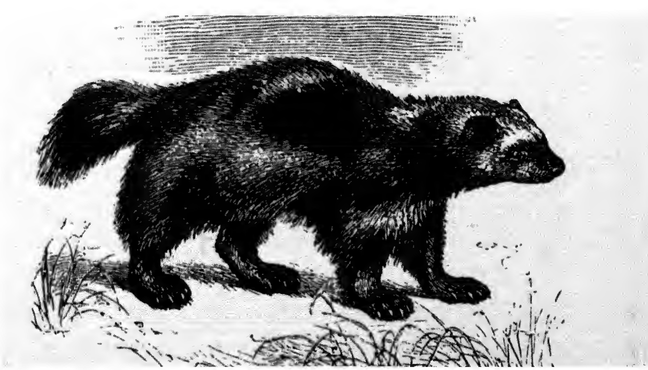


FIG. 105.—The glutton or wolverine. (After Flower and Lydekker.)

the Arctic hare (*Lepus variabilis*), an inhabitant of the Alps and Arctic regions, that, like the Arctic fox, changes the colour of its coat with the seasons, becoming almost

entirely white in winter; the piping hare (*Lagomys alpinus*) now found on the Altai and other lofty mountain ranges of Central Asia, the chamois (*Capella rupricapra*) and the ibex or bouquetin (*Ibex alpinus*), both Alpine animals, and the lemming (*Myodes torquatus*) well known for its extraordinary migrations, when it leaves its home in Northern Europe and travels in dense swarms to the west, crossing brooks and rivers in its course and sometimes swimming out into the North Sea, where it ends its journey with its life.

This array of species, now confined to cold regions, points decisively to a severe climate; and it is sometimes found, as at Sirgenstein in Württemberg, without any admixture of forms which might suggest an opposite conclusion; but elsewhere the lion, hyena, and leopard are also met with. These, however, though now inhabitants of warmer regions, probably possessed considerable powers of endurance; the lion has only become extinct in Europe during comparatively recent and indeed historic times. The great Irish elk and the wild goat which also belong to the Mousterian fauna afford no evidence bearing on the climate.

At the close of the Mousterian age, a deposit was formed in some parts of Germany, which is remarkable for the immense quantity of bones found in it, belonging to many kinds of small animals, chiefly Arctic rodents and above all the lemming. This fauna includes the Arctic hare, the piping hare, various species of voles—one of them (*Arvicola ratticeps*) being a northern form—two species of lemming (*Myodes obensis* and *M. torquatus*) and the Arctic fox; it is extremely similar to the existing fauna of the tundra of north-eastern Russia.

Mousterian remains have been discovered here and

there in the open country, buried in the löss, but these unsheltered stations were probably only summer encampments, and it is to the caves, which seem to have been more frequent resorts, that we turn for our chief sources of information.

The caves of southern or central France have

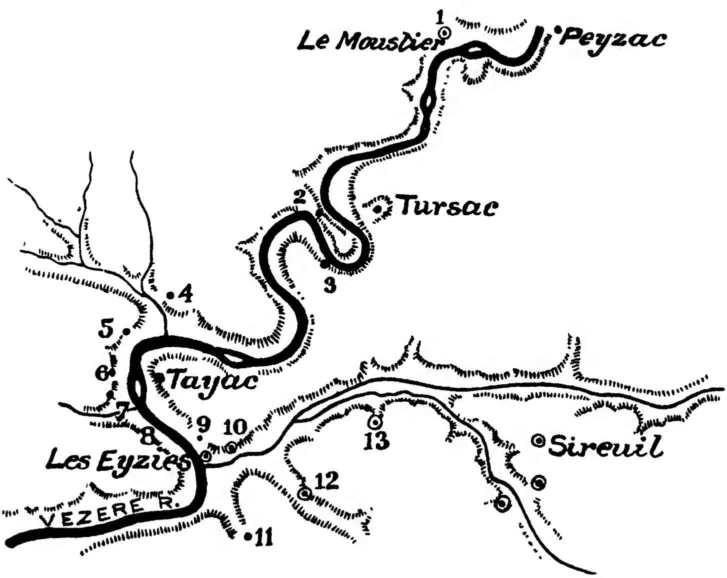


Fig. 106.—Sketch map of the district of Les Eyzies (Dordogne), showing the position of some of the more important caves and rock shelters.

1. Le Moustier.
2. La Madeleine.
3. Marzac.
4. La Micoque.
5. Laugerie Haute.
6. Laugerie Basse.
7. Les Eyzies.
8. Roc de Tayac.
9. Crô-Magnon.
10. Grotte des Eyzies.
11. Grotte de la Mouthe.
12. Grotte de Font de Gaume.
13. Grotte des Combarelles.

furnished the richest spoil, especially those of Dordogne. The district of Les Eyzies (Fig. 106) abounds in caves, all of them famous for their contributions to this branch of study; Le Moustier is one of them.

Of late years Germany has added its contributions, and one of the most precisely investigated caves of

modern times is that of Sirgenstein which has been fully described by Dr. Schmidt.[1]

The Sirgenstein is a lofty cliff of Jurassic limestone which overlooks the broad gentle valley of the Ach between Schelklingen and Blaubeuren in Württemberg. It is about 30 kilometres distant from the ancient moraine of the Rhine glacier. The cave (Fig. 107) opens

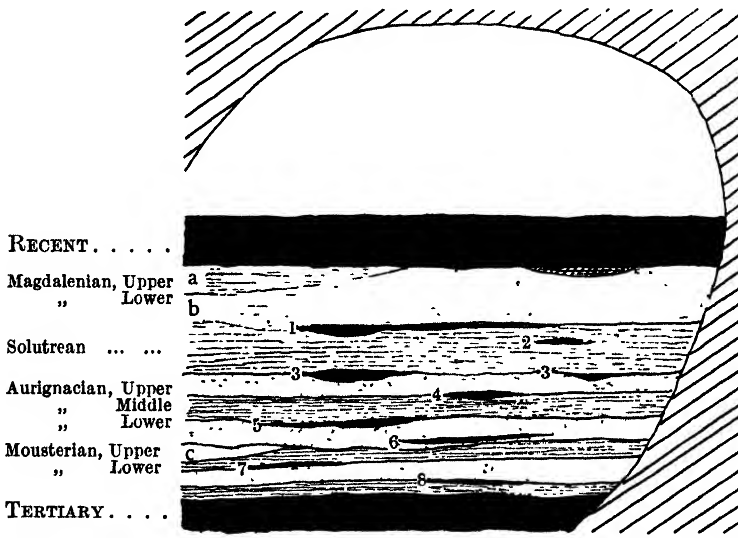


FIG. 107.—Section through the cave of Sirgenstein, Württemberg. a, Layer with bones of *Lagomys pusillus*; b, with bones of *Myodes torquatus*; c, with bones of *Myodes obensis*. The numbered black streaks represent the successive hearths. (After R. R. Schmidt. Scale 1 inch to 5 feet.)

at its foot, about 30 metres above the bottom of the valley; it looks out upon a smiling landscape and is well sheltered from rain and wind.

On removing the cave earth, which had accumulated for untold centuries on the floor, the hearths of several successive periods were revealed, the lowest two being

[1] R. R. Schmidt, *Der Sirgenstein und die Diluvialen Kulturstätten Württembergs*, Stuttgart, 1910, pp. 47, 1 pl.

Mousterian. The embers of the extinct fires lay upon the soil, just as they were left by the inhabitants, stone implements were found plentifully strewn about, and the broken bones of the animals which had served as food. These were big game. The cave bear (*Ursus spelæus*) in the present instance was by far the commonest; this animal was the universal "care-taker," occupying the caves during the absence of the hunters, and receiving short shrift when they returned. It was also a favourite food, as is shown by the great number of bears' bones which are massed together near the threshold of the cave as well as plentifully scattered about. No one cave could have supplied so many bears, and the hunters must have ransacked the surrounding district in pursuit of them. Most of the bones belonged to young animals, which were, no doubt, an easier prey as well as more delicate eating. The wild horse and the reindeer were also hunted, as well as the mammoth, rhinoceros, and bison; the remains of the last named animals are, however, comparatively rare. After the hunters had scraped the flesh from the bones, no doubt with their stone implements, they broke them to extract the marrow, and afterwards threw them on the fire; as they were rich in fat they provided a sort of fuel—probably very malodorous. At Sirgenstein no wood charcoal is found in the hearths, only the charred remains of bones.

In Sicily, where the warm fauna (*Elephas antiquus* and *Rhinoceros Mercki*) seems to have survived into Mousterian times, the hippopotamus furnished abundant food; in the Grotto de San Ciro, near Palermo, the bones of this animal were found in such quantity that, according to a careful estimate, they must have represented the remains of at least 2000 individuals.

The débris of the caves bears witness then to man as the successful hunter, courageously maintaining his existence amidst a crowd of competing beasts of prey. But in one instance,[1] at least, we seem to discover signs of a more ogreish disposition; for the hearth at Krapina in Croatia contains the charred bones of numerous human beings, both young and fully grown, men, women, and children, and this has impressed its discoverer, Gorjanović-Kramberger, with the idea of cannibalism. Considering that the evidence is confined to this single cave and that we meet with nothing similar, or at least so definite, on the Mousterian horizon in other parts of Europe, we may regard this for the present as an isolated instance.[2] There is no reason to suppose that cannibalism was common or widespread, and still less reason for assuming that the human race has passed through a cannibal stage. As a practice, cannibalism is chiefly confined at the present day to black races, who have adopted it sometimes from a perverted religious sense, but more frequently to satisfy the palate, for there can be no doubt that, judged apart from all other considerations and solely as a viand, human flesh is a great dainty. This was certainly the motive in many of the Pacific islands, and the instances in which a warrior ate his enemy in order to obtain his courage were the exceptions and not the rule.[3]

[1] There may be others: see A. Rutot, "Le Cannibalisme à l'époque des cavernes," *Bull. Soc. Préhist. de France*, June, 1907.

[2] Dr. H. Martin points out that while the bones of the lower animals found at La Quina bear abundant marks of scraping and cutting to remove the flesh, not a single bone belonging to the remains of twenty human beings shows any trace of such treatment (*L'homme fossile de la Quina*, p. 253).

[3] According to Flinders Petrie's estimate, 24 per cent. of cannibals eat human flesh because they like it, 18 per cent. when compelled by famine, 19 per cent. to inherit the virtues of their victims, and the remainder, 39 per cent., for various other reasons. It is asserted on the evidence of some recent experiments on the lower animals that human flesh should be physiologically the best food for men.

Isolated cases of cannibalism, brought about by stress of hunger, may occur amongst the highest hunting races, and have not been altogether unknown among civilised white men; the Eskimos are sometimes driven to this terrible resort, but look back upon their act with the greatest shame and conceal it like a crime.

Now let us leave the hearth and visit the tomb.

A little stream, the Sourdoire, flows through the southern part of the department of the Corrèze to join

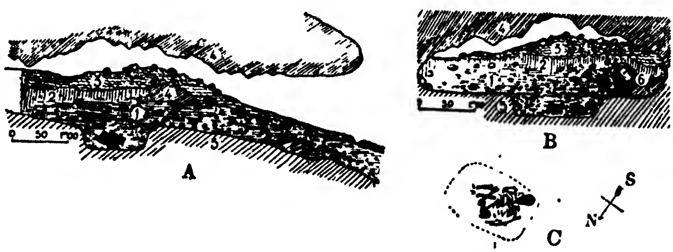


FIG. 108.—The cave of La Chapelle-aux-Saints. A, longitudinal section of the cave taken along the line *l* of the plan; B, traverse section of the cave, taken along the line *t* of the plan; C, plan of the grave. It will be seen that the axis of the grave runs east and west, and the face of the skeleton looks towards the east. 1, Cave earth with Mousterian implements; 2, Clay; 3, Sandy clay; 4, Roof and fallen blocks; 5, Floor.

the Dordogne, and opening on one side of its valley, in the district of La Chapelle-aux-Saints, is the mouth of a cave, which provided a sepulchre for one of the Mousterian hunters.[1]

A magma of bones now forms the floor of the cave to a depth of 30 or 40 cm., and below this is an accumulation of cave earth in which the grave was excavated (Fig. 108). It was a shallow rectangular pit, 1·85 metres in length by 1 metre in breadth and about 30 cm. in depth. The body was deposited, extended

[1] Les Abbés A. and J. Bouyssonie and L. Bardon, "Découverte d'un Squelette humain Moustérien," *L'Anthropologie*, 1908, p. 513.

upon its back, lying in about the same direction as the length of the grave, *i.e.* from east to west. Around it lay a great number of well-worked Mousterian implements,[1] fragments of ochre, and broken bones, and over the head were several long bones of a bison lying flat, one of them still in connexion with some of the smaller bones of the foot and toes, so as to suggest that it was still clothed with flesh at the time it was placed in this position.

This was evidently a ceremonial interment, accompanied by offerings of food and implements for the use of the deceased in the spirit world. It is almost with a shock of surprise that we discover this well-known custom, and all that it implies, already in existence during the last episode of the Great Ice Age.[2]

The discovery of the grave of La Chapelle-aux-Saints was made on August 3, 1907, and soon after, on March 7, 1909, another interment was brought to light in the lower cave of the famous station of Le Moustier itself.[3] The skeleton was that of a young man, about sixteen years of age. It lay on a carefully arranged pavement of flint implements, resting on its right side, with the right arm bent under the head and the left arm extended. Burnt bones and Mousterian implements were disposed about the skull, and a boucher, carefully dressed on both sides, the most beautifully worked of all the implements, lay just within reach of the left hand.

The importance of these discoveries is manifold, and

[1] A full description has lately been given of these by the Abbés A. and J. Bouyssonie and L. Bardon; see "La Station Moustérienne de la 'Bouffia,' Bonneval à la Chapelle-aux-Saints," *L'Anthropologie*, 1913, xxiv, pp. 609–634.

[2] The Abbés Bouyssonie and Bardon have called attention to similar evidence in several other cases; see reference last cited.

[3] H. Klaatsch and O. Hauser, "Homo Mousteriensis Hauseri," *Arch. f. Anthr.*, 1909, N.F. vii, 287–297, pl.

fortunately they are well attested, well-known anthropologists having assisted at every critical stage of their investigation. The skeletons agree in all essential details with a number of others, which had long previously been known as representatives of an extinct race, often spoken of as the Neandertal [1] race, but now referred to a distinct species, *Homo Neandertalensis*. This was already supposed to belong to the Mousterian age, but on evidence which left something to be desired.

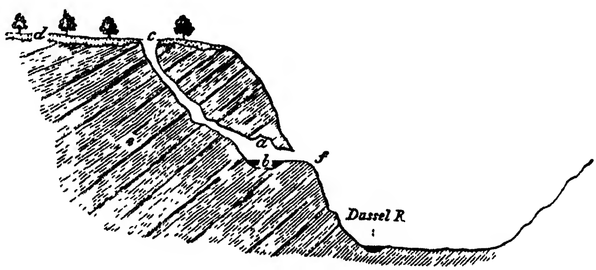


FIG. 109.—Section of the Neandertal cave, near Düsseldorf. (After Lyell.)

These latest examples, owing to the accurate manner in which they are dated, dispel any lingering doubts on this point, and at the same time afford welcome confirmation to the conclusions concerning the characters of the Neandertal race which had been based on previously existing material.

Let us now briefly review the history of this subject.

The Neandertal Skeleton.—The first discovery of the bones of Mousterian man to receive serious attention was made in 1856. Not far from Düsseldorf, in Rhenish Prussia, the valley of the Düssel forms a

[1] It is possible that more than one race of men existed in Europe during Mousterian times. There would be an advantage therefore in restricting the term Neandertal to those Mousterians who are known to have possessed the anatomical characters which it denotes; the term Mousterian may be used in a wider sense, applicable to all the races which lived in Mousterian times.

steep and narrow ravine known as the Neandertal. Its rocky walls of limestone are penetrated by several caves, which owe their origin to the solvent power of running water. In one of these caves (Fig. 109), opening some sixty feet above the present level of the river, the famous Neandertal skeleton was found. It lay embedded in a hard, consolidated loam, and when

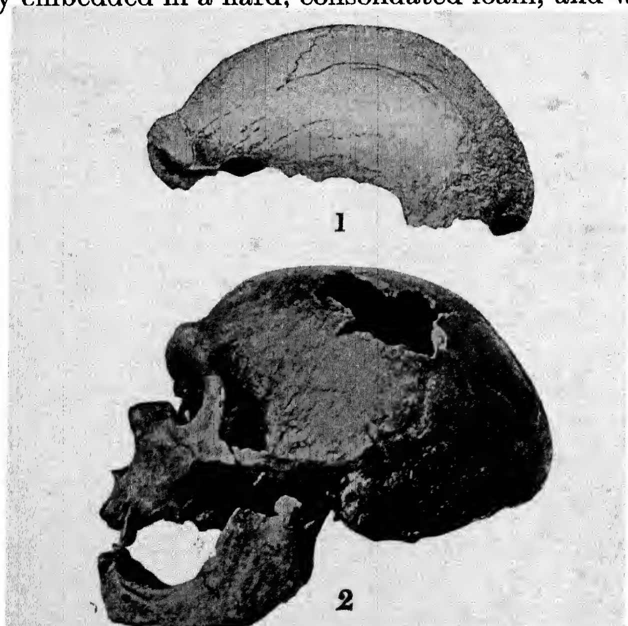


FIG. 110.—1, The Neandertal calotte. 2, The skull of La Chapelle-aux-Saints, seen in profile. (About $\times \frac{1}{4}$.) (1, After Huxley; 2, after M. Boule, *L'Anthropologie.*)

first exposed by the workmen who were quarrying the limestone, was probably complete. Unfortunately, it suffered great injury from their hands, for they had, of course, no conception of its value; but by the opportune intervention of Dr. Fuhlrott, the thigh bones, the upper bone of each arm, shoulder-blade, collar-bone, some fragments of ribs, and, most precious of all, the skull-cap, or brain-pan (Figs. 110, 1; 112, 1; 113, 1),

were rescued from destruction, and are now exhibited in the museum at Bonn.

More than fifty years have elapsed since this momentous discovery was made, and from that time to this it has continued to occupy a foremost place in the investigations of anatomists. When its discoverer first exhibited his specimen before a meeting of German anthropologists at Bonn, doubts were freely expressed as to their human character, and subsequently the famous anatomist, Virchow, endeavoured to explain away the remarkable features of the skull-cap by attributing them to disease. Huxley, whose fame, notwithstanding his brilliance as a writer, will always rest on his genius as an anatomist, arrived at conclusions which we now perceive to have made the closest approach to the truth. He recognised the skull as truly human, but, at the same time, as the most ape-like he had ever beheld, and placed it below the Australian, which he regarded as its nearest existing representative.

So long, however, as this skull was the only one of its kind its testimony failed to produce complete conviction: its age, erroneously assigned by G. de Mortillet to the Chellean, was open to question, and the fauna of the mammoth, though occurring in a similar cave only 130 paces distant, had not been found in actual association with the skeleton itself. It might have belonged to an abnormal individual, great as were the chances against such an accident, and, finally, its completeness left something to be desired. Very welcome, therefore, were the fresh discoveries which followed from time to time down to 1905, and again more recently, from 1908 to 1921; these, while largely adding to our knowledge, unite to confirm the judgement of Huxley expressed in 1863.

The material now accessible to study includes the

following: the Gibraltar[1] skull found in 1848; a lower jaw from La Naulette,[2] found in 1866; part of a lower jaw from Šipka,[3] Moravia, 1879; two nearly complete skeletons from Spy, 1885; a lower jaw from Malarnaud,[4] 1889; various fragments representing perhaps a dozen individuals from Krapina, in Croatia; a skeleton from La Chapelle-aux-Saints, Corrèze, 1908; another from Le Moustier, 1909; two skeletons of adults and two skeletons of children from La Ferrassie,[5] Dordogne, 1909 and 1910; a broken skull of a child from Pech de l'Azé, 1910; a skeleton of a young man from La Quina, 1911, and another of a child of six years, 1921. La Quina has also furnished a number of bones representing twenty different individuals. Finally, we have two jaws from Ehringsdorf, Weimar, and some teeth from Taubach,[6] also near Weimar.

Mousterian teeth have also been found at Saint-Brelade in Jersey.[7] All these remains, though distributed over a wide geographical area, are characterised by similar peculiarities; and by combining the evidence they afford we are able to reconstruct the skeleton of Neandertal man. Wherever the evidence overlaps, it is found to correspond, thus confirming our conclusions

[1] G. Busk, *Trans. Zool. Soc. London*, x, 1879.

[2] E. Dupont, *Bull. Acad. Roy. Belgique*, xxii, 1866; Pruner-Bey, *Bull. Soc. d'Anthr. de Paris*, 1866; E. T. Hamy, *Précis de Paléontologie humaine*, Paris, p. 232.

[3] K. J. Maska, *Der diluviale Mensch in Mähren*, Neutitschein, 1886; A. Rzehak, *C. B. deutschen Ges. f. Anthr.*, xxxvi, p. 67, 1905.

[4] H. Filhol, "Note sur une mâchoire humaine trouvée dans la caverne de Malarnaud," *Bull. Soc. Philomathique de Paris*, 1889, vol. i, p. 69; M. Boule, "La caverne de Malarnaud," *ibid.*, p. 83.

[5] Peyrony and Capitan, *Rev. de l'École d'Anthrop.*, 1909; *Bull. Soc. d'Anthr. de Paris*, 1910.

[6] A. Nehring, "Ü. fossile Menschenzähne aus dem Diluvium von Taubach," *Naturwiss. Wochenschrift*, Aug. 4, 1895; M. Boule, *Les hommes fossiles*, Paris, 1923, p. 146.

[7] R. R. Marett, "Pleistocene Man in Jersey," *Archæologia*, 1911, lxii, p. 449; A. Keith and F. Knowles, "A Description of Teeth of Palæolithic Man from Jersey," *Journ. of Anat. and Phys.*, xlvi, 1911, p. 12.

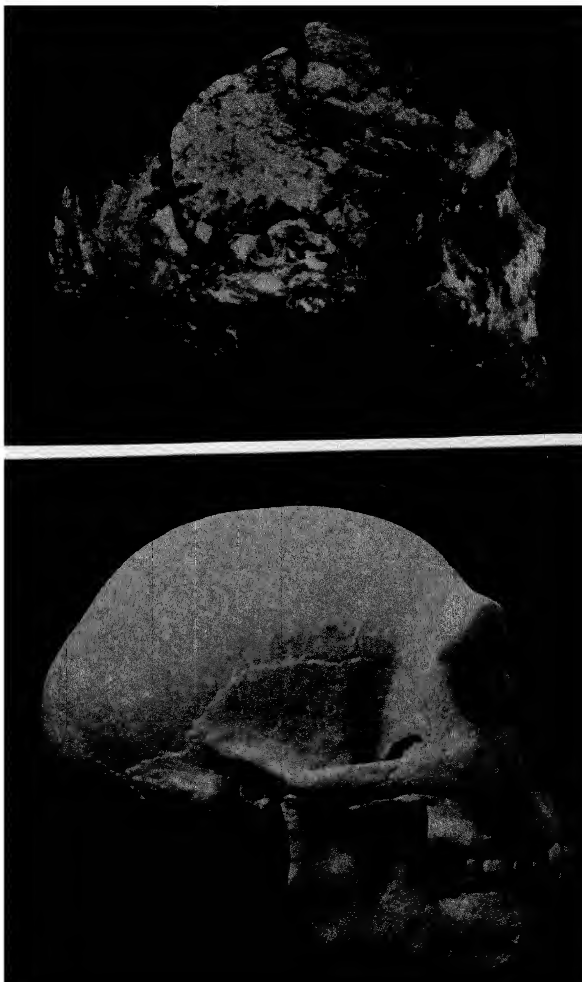


FIG. 111.—1, the Gibraltar skull in profile. (About × ½.) 2, the same as restored by Prof. McGregor.

and dissipating the mistrust which very naturally prevailed when the Neandertal skeleton was the only one known.

FIG. 112.—Front view of Neandertal skulls. 1, Neandertal; 2, Spy; 3, Gibraltar; 4, La Chapelle-aux-Saints. (About × ⅛.) (1, After Huxley; 2, after Fraipont and Lohest; 3, after Sollas; 4, after Boule, *L'Anthropologie.*)

The face,[1] to which we involuntarily turn to gain our first impression of the man, presents a singular aspect,

[1] This was described for the first time from the Gibraltar skull, in which this part of the cranium is better preserved than in any other. The Gibraltar skull is further the only one which retains the base almost uninjured.

unlike that of any existing race (Figs. 110, 2; 111; 112, 3 and 4). One of the most salient features is the prominent ridge which extends continuously from temple to temple at the base of the forehead; it is formed by an excessive growth of the brow ridges, the supra-temporal ridges, and the glabella, the latter a prominence of the forehead immediately above the root of the nose. These several regions are not only greatly developed, but they have become completely confluent, forming a single ridge, which we may speak of as the frontal torus. The only existing race in which the frontal torus at all approaches that of the Neandertal skull is the Australian, and even this does so only remotely.[1] In the Australian skull the torus is rarely, if ever, so completely continuous and uniform as in the Neandertal; its dimensions are less and its characters different. In the Neandertal skull the torus receives additional emphasis from the presence of a corresponding depression which runs parallel with it along its upper margin (Figs. 110 to 113). This trough is spoken of as the frontal fossa; nothing resembling it occurs in the Australian skull. In the Australian skull it is the glabellar region of the torus that is most protuberant, projecting farthest immediately above the root of the nose, which looks as if it had been squeezed in close under the glabella; this gives an appearance of concentration—almost indeed of ferocity—to the Australian face. In the Neandertal skull the torus does not descend in this fashion: it rises well above the eyes and root of the nose, recalling its disposition in the chimpanzee.

[1] See, however, D. J. Cunningham, "The Evolution of the Eyebrow Region of the Forehead; with Special Reference to the Excessive Supra-orbital Development in the Neandertal Race," *Trans. Roy. Soc. Edin.*, 1908, xlvi, pp. 285–311, 3 pls.

The orbits are large and round, and rise upwards, encroaching on the forehead.

The nasal aperture is remarkable for its great size, particularly in breadth; the nasal bones are broad and concave upwards, and the sides of the nose pass backwards into the cheeks without the marked distinction which occurs in recent races. Thus, although the soft parts of the nose have disappeared, we may conjecture that this organ was of unusual dimensions; it probably projected in a snout-like fashion of its own, not comparable with anything we know either among men or the man-like apes.

The distance from the root of the nose to the mouth was greater than in any existing human race.

In the imaginary restorations which have from time to time been ventured on by painters and sculptors, the face is always represented as prognathous, that is, with projecting jaws. This was mere guess-work, prompted by analogy with the apes. As it happens, however, marked prognathism did exist, but only in some cases: it is present, for instance, in the skulls of La Chapelle-aux-Saints and Le Moustier; in others it is absent. Observations made on the Krapina fragments and the Gibraltar skull reveal a face as truly orthognathous as in many a civilised white man. There is nothing inconsistent, however, in these observations. The aborigines of Australia present just as wide a range of variation in this character. In any large collection of Australian skulls every degree of transition may be traced between faces which are truly orthognathous and others which attain an extreme degree of prognathism.

At the same time, the jaws of the Neandertal skull present some remarkable peculiarities: they are large and parallel-sided; the lower jaw in particular is heavy

and massive and especially distinguished by the absence of a chin.[1] In the existing lower races of mankind the chin is often notably reduced in size, but never completely suppressed. As we have seen, the same absence of a chin, even more strongly expressed, is to be found in the Heidelberg jaw, so that this simian character, though still persisting, is evidently on the wane. Again, as in the Heidelberg jaw, the little bony processes which lie within the angle of the jaw and give attachment to the muscles of the tongue concerned in speech appear to be missing; and from this it has been erroneously inferred that the power of speech was not fully developed.

The dental arcade recalls the U-shape of the anthropoid apes, and the incisors of the lower jaw bite against those of the upper jaw instead of behind them, in some cases indeed the lower jaw is so underhung that the lower bite in front of the upper incisors.

The teeth [2] are large, but retain few primitive characters. In some cases, as in the teeth of St. Brelades, Jersey, and Krapina, the roots of the molars, especially the wisdom teeth, have ceased to be divergent and have even lost their individuality, being fused together into a single column. The significance of this is not clear.

The pulp cavity, as revealed by *X*-rays, is unusually large in these teeth, but this peculiarity is not a constant

[1] Linnæus included the chin amongst the characters distinctive of man; but it is obviously present in some infantile gorillas having a well-developed milk-dentition. E. Selenka, *Studien in Entwickelungsgeschichte*, Wiesbaden, 1899, p. 143. It is said to be prominent also in the young orang. Wiedenreich, *Anat. Anz.*, 1904, p. 314.

[2] The teeth of the Krapina men have been discussed at length by P. Adloff, "Die Zahne des Homo primigenius von Krapina," *Zeits. f. Morph. u. Anthr.*, 1907, x, 197–202, *Das Gebiss des Menschen und der Anthropomorphen*, 1908; and Gorjanović-Kramberger, "Die Krone und Wurzeln der Mahlzahne des Homo primigenius, etc.," *Anat. Anz.*, 1907, xxxi, 97–134, and "Bemerkungen zu Adloff," *Anat. Anz.*, 1908, xxxii, 145–156, pl. See also Duckworth, *Prehistoric Man*, p. 29 ff.

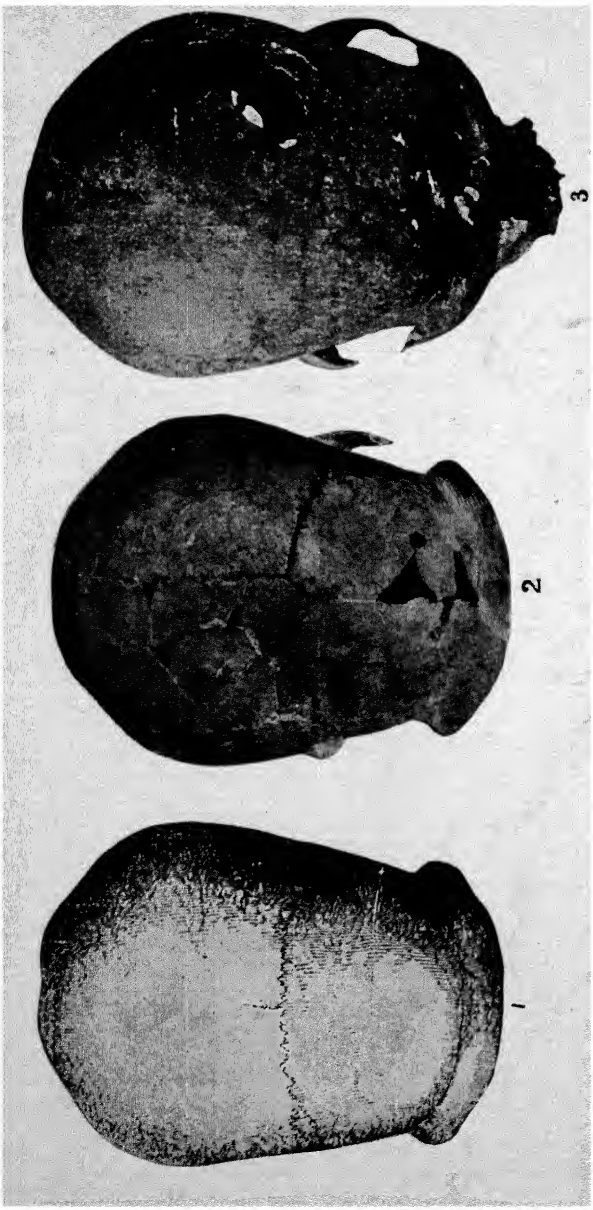


FIG. 113.—Neandertal skulls seen from above. 1, Neandertal; 2, Spy; 3, La Chapelle-aux-Saints. (About × ⅓.) (1, After Huxley; 2, after Fraipont and Lohest; 3, after Boule, *L'Anthropologie.*)

character, being absent, according to Prof. Boule, from the teeth of the Ferrassie skeleton.[1]

The brain-pan is consistent with the face: the swollen frontal torus and its accompanying fossa have already been alluded to. Beyond the fossa the forehead is receding, and the skull rises to a comparatively low vertex; the occiput is distinguished by a similar slope in the opposite direction, and swells into a strong ridge for the attachment of the powerful neck muscles. The walls of the skull are thick, and the thickness of the frontal region is prodigious. In this region the floor of the skull rises up to an unusual extent, so that, owing to this and the thickness of the frontal bones, the space left for the frontal lobes of the brain is very much diminished. It is in these lobes that the faculty of speech is lodged. Some compensation for the diminished height of these lobes is afforded, however, by an increase in breadth, the skull being a little wider than usual in front (Fig. 113).

The elevation of the anterior end of the base just alluded to is one of the most important of the distinctive features of the skull (Figs. 114, 5, and 116). It is a marked simian character.

The nasion angle is also very instructive, since it measures the magnitude of the arc over which the brain extends, and it is no doubt associated with the upward inclination of the base. In the Gibraltar skull it has a negative value of 10°, in the skull of La Chapelle-aux-Saints of 17°. In Fig. 23 (p. 54) a sagittal section of the last-named skull, the nasion radius is seen to lie almost midway between the corresponding radius of a Swede and a chimpanzee, but rather on the

[1] Keith and Knowles, *Journ. Anat. and Phys.*, 1911, xlvi, p. 2; A. Keith, *Proc. Roy. Soc. Med.*, 1913, vi (Odont. Sec.), p. 1; M. Boule, *Les hommes fossiles*, p. 214.

simian than the human side. It will be observed at the same time that the bregmas of the two skulls are nearly coincident.

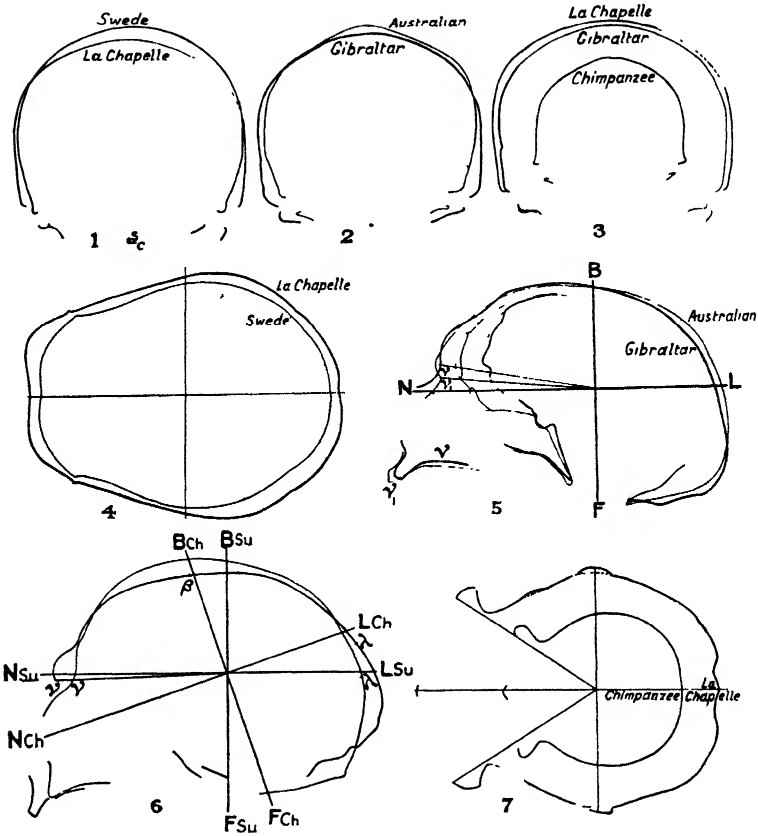


FIG. 114.—A comparative study of the skull of *Homo Neandertalensis* by means of sections. Transverse sections 1, taken through the basion and auditory meatus of the skull of La Chapelle-aux-Saints and of a Swede; 2, of the Gibraltar skull and an Australian skull of 1310 c.c. capacity; 3, of the skulls of La Chapelle-aux-Saints, Gibraltar and a Chimpanzee; 4, Horizontal sections through the skulls of La Chapelle-aux-Saints and a Swede; 5, Sagittal sections through the skull of an Australian, cranial capacity 1190 c c. and the Gibraltar skull; 6, Sagittal sections of the skull of La Chapelle-aux-Saints (Ch) and of a Swede (Su) superposed on a common centre and the nasion radius; 7, Horizontal sections of the skull of La Chapelle-aux-Saints and a Chimpanzee.

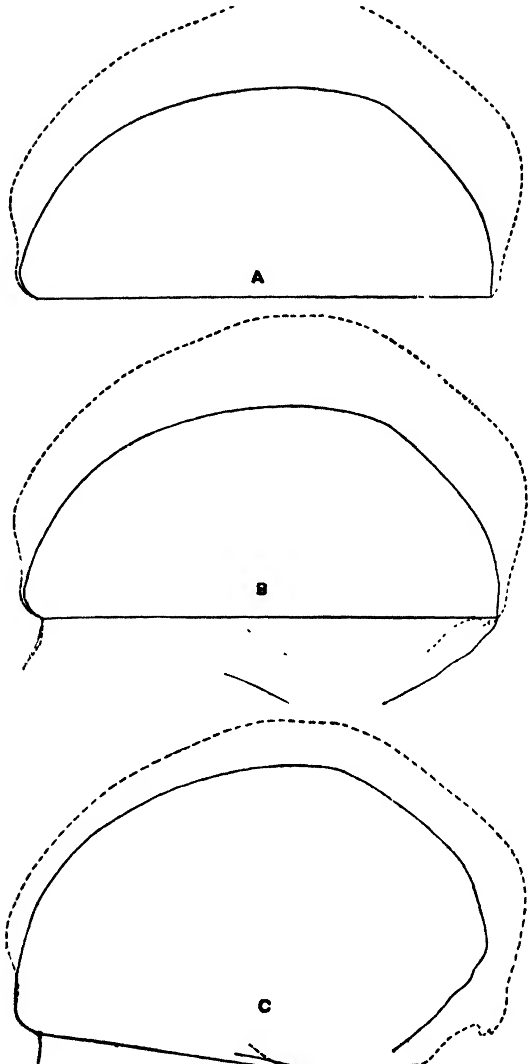


Fig. 115.—Diagrams to illustrate the fallacious use of the nasi-inion line. A, The cranial vault of an Australian (continuous line) and a European (dotted line) superposed in profile on the nasi-inion line. The base being disregarded, an exaggerated estimate will be formed of the difference in capacity. B, The cranial vaults completed by addition of the base. It will be seen that the base of the Australian skull extends almost as much below that of the European as the vault of the European rises above that of the Australian. C, The two skulls superposed in profile on the nasi-basal line. The comparison which may now be made approaches closely to the truth.

Notwithstanding these indications of inferiority, the capacity of the skull is surprisingly large. It was originally supposed to amount to only 1250 c.c., but this estimate was based on a fallacious inference from the Neandertal skull-cap. The supposed fixity of the external occipital protuberance (inion) had at one time become almost a superstition among anatomists, and it was consequently made use of, in conjunction with the glabellar point, to obtain a fixed line of reference. When the Neandertal skull-cap and the corresponding part of a European skull were compared on the basis of this line or what comes to the same thing, the nasi-inion line, a great disparity was found to distinguish them (Fig. 115 A). The inion, however, does not possess the constancy attributed to it; it varies in position like most other muscular attachments, and the error which may result if it is taken as a fixed point is by no means small. This will be seen from the next diagrams; in Fig. 115 B the complete skulls of an Australian and a European are superposed in profile on the nasi-inion line, and in Fig. 115 C they are similarly superposed on the base drawn from the nasion to the opisthion.

The distinguished anatomist, Prof. Schwalbe, still maintains the old fallacy and appeals to the consistence in results which are obtained by superposing longitudinal sections of the various Neandertal skulls on the glabella-inion base, as an argument in his favour. This consistency, however, is simply due to the constancy with which the inion has shifted its position upwards in all these skulls.[1] The displacement of the inion is

[1] M. Henri Martin has measured the amount of this displacement in one of the La Quina examples of the Neandertal skull by drawing a line within the skull from asterion to asterion and determining the height of the external inion above this datum. It was found to be 32·5 mm. In four modern skulls a range of from 13 to 19·5 mm. was observed (*L'homme fossile de La Quina*, Paris, 1923, p. 79).

an important anatomical character, and should have an important physiological significance. It has been correlated, I fancy rather illogically, with the possession of strong neck muscles. As we shall see directly, there is reason to believe that the attitude of Neandertal man was affected with a slight stoop; this would necessitate throwing the head back to keep the face in its proper position, and this again would lead to a shifting upwards of the muscular attachments at the back of the head, including the inion.

Fortunately the skull of La Chapelle-aux-Saints is sufficiently complete to permit of the direct measurement of its capacity in the usual way, *i.e.* by determining the volume of shot or millet-seed it will contain. M. Boule [1] has taken advantage of this fact and finds that the capacity thus measured amounts to 1620 c.c. —a remarkable quantity of brains for a man only 1550 mm. (5 ft. 1 in.) in height. The Spy skulls are probably not less capacious; the Neandertal is estimated by M. Boule at 1408 c.c. and the La Quina at 1367 c.c.

The Gibraltar skull [2] is evidently smaller; even the external measurements show this, and a careful estimate based on direct measurement with millet-seed gave as the capacity only 1250 c.c.[3] It is possible that this skull belonged to a woman; the corresponding capacity

[1] M. Boule, "L'homme fossile de la Chapelle-aux-Saints," *Annales de Paléontologie* (1911–1913). This masterpiece is the most complete account we possess of Neandertal man.

[2] "On the Cranial and Facial Characters of the Neandertal Race," *Phil. Trans.*, 1907, cxcix, pp. 281–339; G. L. Sera, "Nuove Osservazioni ed Induzioni sul Cranio di Gibraltar," *Arch. per l'Antropologia e la Etnologia*, Florence, 1910, xxxix, fasc. 3, 4 pls.

[3] Prof. Keith has estimated the capacity at 1080 c.c.; I feel sure this falls short of the true capacity, owing probably to some defect in the method of measurement. Prof. Boule gives it as 1296 c.c., but this number was obtained indirectly by calculation. When handling the skull I gained the impression that the capacity was much smaller than it actually proved to be. With an incomplete skull estimates may easily vary a few centimetres.

for a man might be about 150 c.c. more, or 1400 c.c. This would be well within the limits of variation of the race, which seems to have possessed an average cranial capacity of nearly 1500 c.c. In this respect the Mousterian race was far superior to the Australian, and not far inferior to the European, whose average capacity is below 1550 c.c.

It may be asked what inferences can be drawn from this fact; a question not easy to answer, at least with any completeness. Cranial capacity is a measure of the volume of the brain and thus it is clear that the Mousterians were men with big brains.

Looked at broadly the size of the brain seems to be connected with the taxonomic rank of the race; in the apes the cranial capacity never attains, so far as is known, as much as 600 c.c.; in what we are accustomed to regard as the lower races of mankind, *e.g.* the Australians, an average of 1250 c.c. is commonly met with, while in the higher races, such as Europeans, 1550 c.c. is rather above the average. But when we proceed to details, the connexion between cranial capacity and mental endowment is less obvious. The result of numerous investigations carried out during the last quarter of a century is to show that, within certain limits, no discoverable relation exists between the magnitude of the brain—or even its gross anatomy—and intellectual power. The following list illustrates this conclusion.

	Cranial capacity.	Weight of brain.	Authority.
Bismarck	1965 c.c.	1867 gms.	Waldeyer.
Kant	1715	—	Kupfer and Hagen.
Bobbe (a robber and murderer)	—	1510	R. Wagner
Mohl (a distinguished botanist)	1431	—	A. Froriep.
Mohl	1500	—	Buschan-Stettin.

	Cranial capacity.	Weight of brain.	Authority.
Gauss	—	1492 gms.	Rudmeyer.
Skobelew (General)	—	1451	Sernoff.
Mommsen	—	1429	Hausemann.
Liebig	—	1353	—
Menzel	—	1298	Hausemann.
Bunsen	—	1295	Do.
Leibniz	1422 c.c.	1257	His.
Gambetta	—	1247	Duval.
Do.	-	1160	Paul Bert.

It thus appears that there is no apparent reason why a great man should not possess a large brain (Bismarck); on the other hand, he may attain the highest flights of genius with a comparatively small one (Leibniz).

The dissection of the brains of criminals and of distinguished men fails to reveal any characteristic differences between them.

Since the motor-centre for speech is situated in Broca's area, we might have expected to find some connection between great linguistic powers and the size or complication of the lower frontal lobe, but even this is not the case. Dr. L. Stieda [1] gives an interesting account of Dr. Georg Sauerwein, who was master of forty or fifty languages; after his death, at the age of 74, on December 16th, 1904, his brain was dissected by Stieda, but it revealed nothing which could be correlated with his exceptional gift.

The magnitude and visible complexity of the brain are possibly two of the factors which contribute towards the manifestation of intellect; but they cannot be the only ones: there must be others of equal or even greater importance, such as the ultimate structure of the grey matter, and the degree of perfection in the adjustment of parts. It is possible that the character of the circu-

[1] L. Stieda, "Das Gehirn eines Sprachkundigen," *Zeitschr. f. Morph. u. Anthrop.*, xi (1908), p. 81.

lation and the nature of the blood-supply may not be without influence, so that the intellect may actually be an affair, not only of the head, but the heart. There may be yet other factors of a more recondite character.

Whatever other significance the size of the brain may possess—or lack—it is, in any case, a morphological character of great importance, and a difference of 250

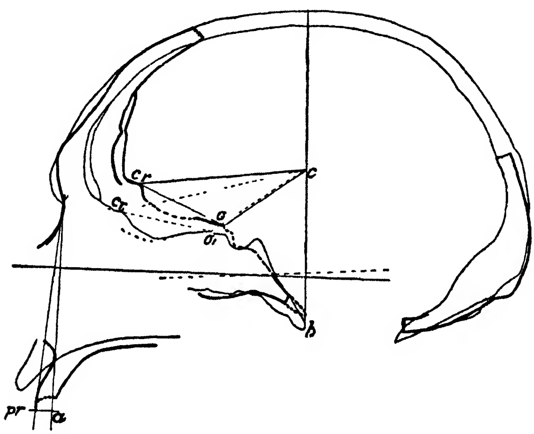


FIG. 116.—The Gibraltar skull (thick line) and a low form of Australian skull (thin line) compared. The longitudinal sections are superposed, a line drawn from the centre of the sections to the front of the great foramen serving as a common base. Attention may be called to the elevation of the base and the great thickness of the frontal bone in the region of the glabella of the Gibraltar skull, and the absence of a frontal fossa in the Australian skull.

c.c. or say nearly 20 per cent. in average capacity, such as distinguishes the Australian from the Mousterian, cannot be disregarded. Judged from the cranial capacity alone, the surviving Australian evidently stands on a lower plane than the extinct Mousterian.

In a great number of other characters, however, the Australians of all races make the nearest approach to the Mousterians. Many of the more brutal Australians, especially among those inhabiting the south of the

continent, present a depressed cranial vault with receding forehead and occiput, almost identical in profile

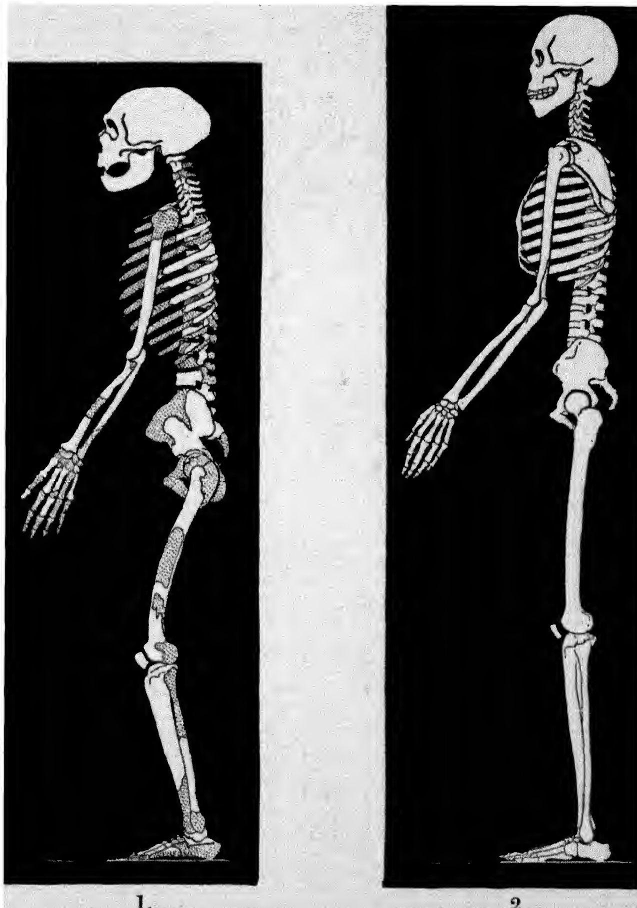


FIG. 117.—The skeleton of Neandertal man (1) restored according to Prof. Boule, for comparison with the skeleton of an Australian (2). (After Boule.)

with some forms of Neandertal skull (Fig. 117): there is a resemblance, though not identity, in the characters of the frontal torus; and the lower jaws, with the teeth,

present some analogies. These resemblances must not be pushed too far, and there are important differences which must not be overlooked. Apart from distinctive features in the skull, the Neandertal skeleton is more robust than that of the Australian, and it presents some characters, such as the curvature of the thigh bone, which suggest that Neandertal man maintained less habitually a completely erect attitude (Fig. 117). This did not escape the attention of the late Prof. Fraipont, and more recently M. Boule has given good reasons for attributing a slight stoop to the men of this species.

The Australians are not only another race, they are a different species, and, notwithstanding the many characters which they share in common with the Neandertalians, they can no longer be regarded as directly descended from them.

Let us now resume our survey. As we have seen, the Neandertal skull itself is undated, and nothing is known of the age [1] of the Gibraltar skull—the only example, until the discovery of La Chapelle-aux-Saints, in which the face is preserved in its natural relation to the cranium; but of the remaining specimens we are better informed.

Spy.—The cavern in which the two skulls of Spy were discovered by Prof. Max Lohest is situated in Carboniferous limestone which forms a wooded hill above the Orneau, in the commune of Spy. Near its mouth lay a pile of débris composed of several layers (Fig. 118), for the greater part Aurignacian in age. In

[1] Except by its own characters which point to the Mousterian age. That Mousterian man inhabited the country near Gibraltar has been proved by Dr. Duckworth, and recently Prof. Breuil has given circumstantial evidence to show that the skull was included in a Mousterian deposit. L'Abbé H. Breuil, "Palæolithic Man in Gibraltar," *Journ. R Anthr. Inst.*, lii, 1922, p. 46.

the lowest layer (*d*), containing rough Mousterian points and the fauna of the mammoth (*E. primigenius*, *R. tichorhinus*, *Ursus spelæus*, *Hyæna spelæa*, etc.), two fragmentary human skeletons were found, the remains of two individuals who had, it has been suggested, been killed by a fall of stones from the roof. It is more probable, however, that we have here another case of interment.

They have been very completely described in a series

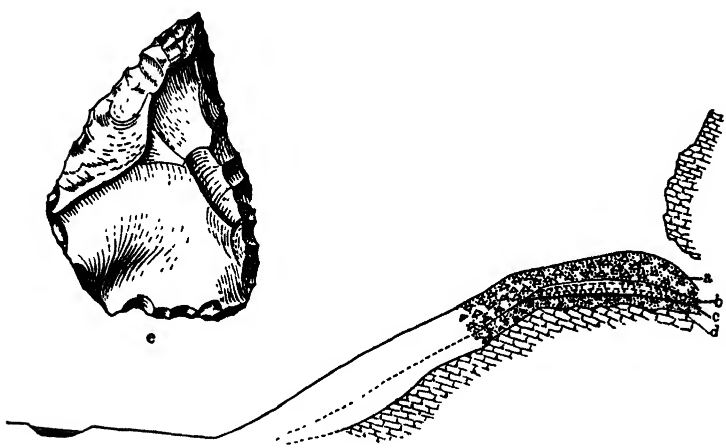


FIG. 118.—Section of the Grotte de la Biche-aux-Roches, near Spy. *a*, Brown clay and fallen fragments; *b*, yellow earth and tufa containing bones; *c*, red earth with bones; *d*, brown clay and charcoal with the two skeletons; *e*, a Mousterian point from the lowest layer in which the skeletons were found. (After M. de Puydt and Max Lohest.)

of admirable memoirs by Profs. Fraipont [1] and Max Lohest of Liège, who have shown how completely they agree in all their anatomical characters with the remains from Neandertal.

[1] See in particular J. Fraipont and Max Lohest, "Recherches Ethnographiques sur les Ossements Humains découverts dans les dépôts quaternaires d'une grotte à Spy," Gand, 1887, pp. 587–757, extr. *Arch. de Biologie*, and M. de Puydt and Max Lohest, "L'Homme Contemporain du Mammouth," *C. R. Congrès de Namur*, 1886, pp. 36, 10 pls.

Le Trou de La Naulette.—On both sides of the valley of the Lesse, just above its confluence with the Meuse, several caverns open near the middle of its slope, at heights of from 75 to 100 feet above the river. The cave of La Naulette is one of these; it was flooded, during the Lower Palæolithic epoch, at irregular intervals by the Lesse, when that river flowed at a height of about 90 feet above its present level. Each inundation left a deposit of loam on the floor of the cave, and the time which elapsed between successive inundations was sufficient to allow of the growth of an incrustation of stalagmite; there are seven of these stalagmite floors and seven layers of loam. At a depth of 15 feet below the lowest stalagmite the famous jaw of La Naulette was found. Its simian characters led some anatomists, amongst them the famous Virchow, to deny that it was human; but the subsequent discoveries at Spy and Krapina leave no doubt on this point, and we now recognise it as appropriate to the Neandertal skull.

The bones of the other animals found in this cave mark the fauna of the mammoth.

Krapina.—The hollow in which the ossiferous deposits occur at this locality is not so much a cave as a recess, which was excavated by the river Krapinica, as it washed against a cliff of friable Miocene sandstone. Since accomplishing this work, the river has sunk its bed 82 feet below the floor of the recess; and the recess itself is now completely filled with débris (Fig. 119). At the base is a layer of pebbles left by the river; over this lie sand and loam, partly deposited by flood waters, partly formed by dust weathered from the walls: fallen angular fragments are scattered throughout. Here and there, lenticular layers, dark grey and red in colour,

are intercalated with this material. They mark the site of successive occupations by man; burnt sandstone, charcoal, broken and burnt bones and stone implements are found in them. The lowest layer seems to indicate a dwelling-place; it contains the fragmentary remains of ten or twelve individuals of different ages, children

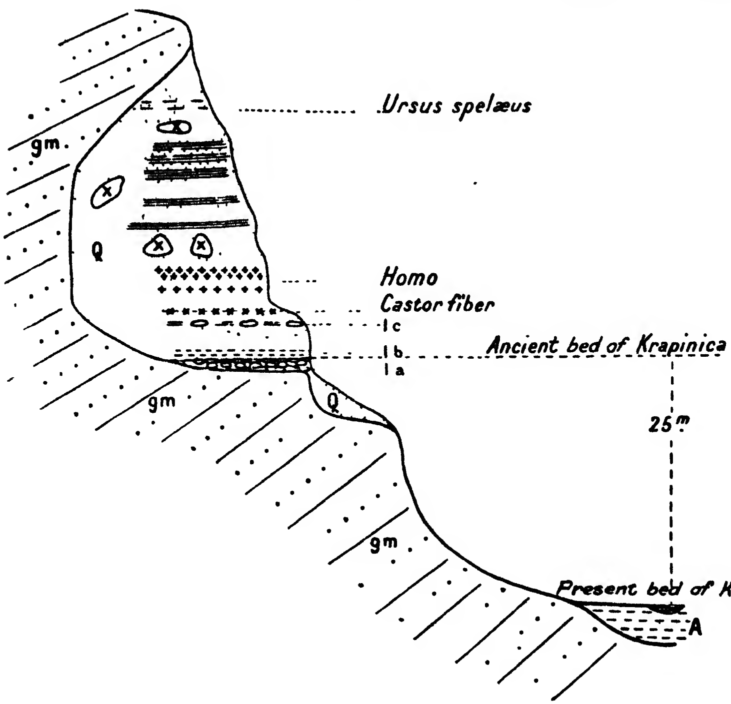


FIG. 119.—Section of the rock shelter at Krapina. *A*, Recent alluvium; *Q*, Pleistocene alluvium; *gm*, Miocene sandstone; 1*a*, gravel; 1*b*, sandy clay; 1*c*, flood deposits; ×, fallen blocks of sandstone. Height of recess from floor to roof 8·50 metres. (After Gorjanović-Kramberger, *L'Anthropologie*.)

and adults, all of whom possessed the distinctive characters of the Neandertal race. The bones are all broken and more or less burnt; and on this evidence, as we have already pointed out, some have suspected Mousterian man of cannibalism.

The fauna of this station includes *Rhinoceros Merckii*, *Ursus spelæus*, and *Bos primigenius*. It is a warm fauna. The implements are rough flakes of admittedly Mousterian type; some have been made out of the pebbles of the Krapinica river, and retain a part of their original surface. Some rude implements of bone are said to occur with them, one of which has been spoken of as a bone "axe."

The discoverer of these relics, Prof. Gorjanović-Kramberger,[1] regards them as older than the last mountain movements which have affected the district, and their date was for a long time open to question.

A Mousterian industry, however, associated with a warm fauna determines the age. The Krapina men lived in Lower Mousterian times, and thus preceded by a considerable interval the men of La Chapelle-aux-Saints.

They agree sufficiently, however, in all important characters to be included in the same species, while their minor differences mark them as a distinct race.

The skulls though fragmentary are extremely instructive, and Prof. Kramberger has been able to show that they indicate a short-headed people. They are the only known brachycephals of the Mousterian age.

La Chapelle-aux-Saints.—It is at this stage that we recognise the value of the discovery made at La Chapelle-aux-Saints, for it was here that the age of the Neandertal man was first definitely determined, and that with a certainty which puts it beyond the range of doubt. The industry is typical Mousterian

[1] Gorjanović-Kramberger, "Der paläolithische Mensch und seine Zeitgenossen aus dem Diluvium von Krapina in Kroatien," *Mith. Anthr. Ges.*, Wien, 1901. xxxi, pp. 163–197; 1902, xxxii, pp. 189–216; 1904, xxxiv, pp. 187–197; 1905, xxxv, pp. 197–229; "Der diluviale Mensch von Krapina," *Biol. Centralblatt*, 1905, xxv, p. 805, and *Der diluviale Mensch von Krapina in Kroatien*, Wiesbaden, 1906, pp. 200, 14 pls.

and the fauna is the fauna of the reindeer and the woolly rhinoceros. The age is therefore Upper Mousterian; it belongs to the early days of the Upper Monastirian.

The skeleton, which is remarkably complete, has been described by Prof. M. Boule [1] in an exhaustive monograph which will always remain the standard of reference on this subject.

The skull was obtained in fragments, but these have been pieced together with such scrupulous care that we may accept the restoration as a faithful reproduction of the original form. As previously remarked, that part of it which corresponds with the Neandertal skull-cap is almost identical with it in shape. The face repeats the characters found in the Gibraltar skull in almost every particular, the chief exception being the presence of marked prognathism.

Le Moustier.—The skeleton of a youth, about sixteen years of age, found at Le Moustier has been described by the late Prof. Klaatsch. There is no doubt of its age, it is genuinely Mousterian.

Attempts to build up the skull from its constituent fragments succeeded in producing a result so remarkable that when the lower jaw was fitted into the skull it was found that its incisor teeth stood 10 mm. behind those of the upper jaw. Prof. Boule has not unfairly stigmatised this reconstruction as a caricature.

It was afterwards discovered that too much plasticine had been introduced between the fragments of the skull, making the cheeks too long and the orbits too large; so a second attempt was made, with a result

[1] M. Boule, "L'homme fossile de la Chapelle-aux-Saints," *L'Anthr.*, 1908, xix, pp. 519–525; 1909, xx, pp. 257–271, and *Annales de Paléontologie*, Paris, 1911 (1913), vi, pp. 278, 16 pls.

which seems to be an improvement on the first; it is warmly praised by Prof. Schuchardt,[1] who, commenting on the fact that the skeleton cost the German people £5000, remarks that the teeth alone are worth the money.

The skull affords a welcome confirmation of the results obtained from other material; it is evidently of great capacity, thus agreeing with the skulls from Spy and La Chapelle-aux-Saints. The face resembles that of the Gibraltar skull, except for its excessive prognathism.

The bones of the extremities agree, in fundamental characters, with those of other Neandertal skeletons, and indicate a stature of from 1450 to 1500 mm. The adult, probably fifty years of age, from La Chapelle-aux-Saints, was, as already remarked, about 1550 mm. in height. All the evidence goes to show that the Neandertal men were of short stature with disproportionately large heads.

The implements found at Le Moustier were all Mousterian except one, an Acheulean boucher which lay near the left hand of the skeleton, but, as we have already seen, this boucher continued to exist into Mousterian times.

La Ferrassie.—This famous rock-shelter has recently added another Neandertal skeleton to the five previously discovered by Prof. Capitan and Dr. Peyrony.[2] This sixth interment is that of a child about five years old and, as in four of the previous interments, the skeleton was protected by an overlying stone slab.

The deposits at the spot where the grave was found are as follows:

[1] Schuchardt, *Prehist. Zeits.*, iv, 1912, p. 443.

[2] Capitan and Peyrony, "Découverte d'un sixième squelette Moustérien à la Ferrassie, Dordogne," *Revue Anthropologique*, année 31, 1921, p. 384.

1. Fallen débris and soil.

2 to 4. Successive horizons of Upper, Middle and Lower Aurignacian.

5. Upper Mousterian, a thin irregular layer.

6. Fallen débris of Mousterian age.

7. Mousterian, an irregular layer of black earth. In

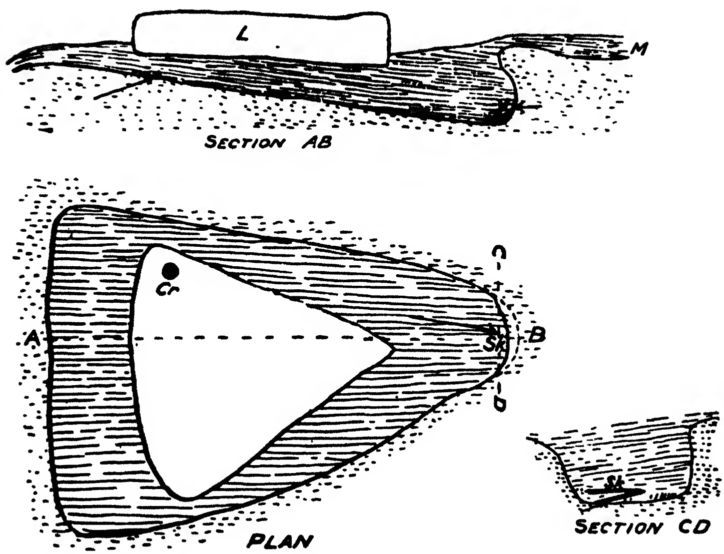


FIG. 120.—Plan and sections of the grave of the Mousterian child. Section AB: M, Mousterian layer; L, covering slab; X, skeleton. Plan: Cr., cranium; Sk., skeleton. Section CD: Sk., skeleton. (After Capitan and Peyrony. *Rev. Anthrop.*)

this the skeleton: the deposits above it are horizontal and undisturbed.

8. Red-brown sands forming the floor of the cave.

The grave was excavated in the form of an irregular isosceles triangle and extended down to the sands at the bottom. At the narrow end lay the skeleton deprived of its skull, and directed east and west with the feet to the west, as were the previously discovered

skeletons. The bones of the legs were folded on themselves.

The skull lay apart from the skeleton, 1·25 m. away from it, under one corner of the covering stone slab. It was damaged and had lost the bones of the face. Evidently the head had been severed from the body before interment and had been separately buried. This is the first indication we meet with of a custom that

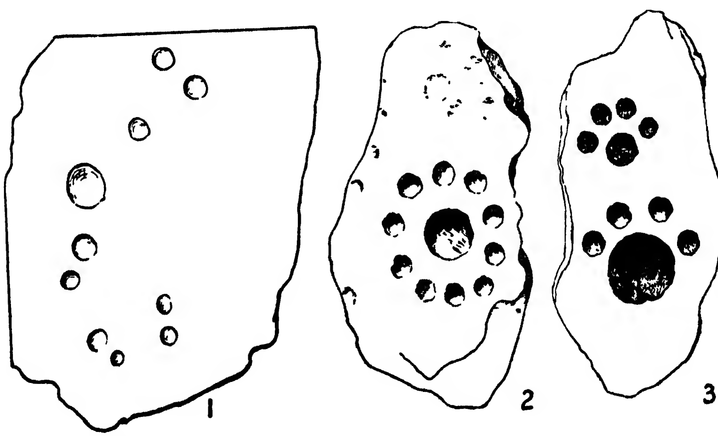


FIG. 121.—Palæolithic cup-stones. 1, Mousterian, from La Ferrassie (after Capitan and Peyrony, greatly reduced); 2, 3, Aurignacian, from L'abri Blanchard (after Didon. $\times \frac{1}{20}$).

became prevalent later, as we shall find when treating of the Azilian skulls of Ofnet (p. 608).

Additional interest is afforded to this interment by the covering slab, which bears on its lower surface several "cup-holes" associated apparently in pairs (Fig. 121, 1).

Similar cup-holes, but of comparatively recent date, have long been known to antiquaries and have provoked, but without satisfying, much curiosity as to their meaning. They occur on tombs and megalithic monuments over a large part of the world, in Europe from

Spain to Scandinavia; they are common all over the British Isles, in North Africa, Arabia, Palestine, Hindustan, and the Indian mounds of North America. In time they have long been known to range from the Neolithic, through the Bronze Age, into early Christian days, as is shown by their occurrence in the walls of early Christian churches. Modern investigations of caves have revealed their presence in Aurignacian deposits (Fig. 121, 2, 3), and this latest discovery carries them still farther back into the Mousterian age.

They are evidently symbolic and their frequent association with funerary monuments seems to connect them with a cult of the dead. Even still in these days of enlightenment offerings to departed spirits are sometimes placed in them, and in some parts of Germany the cup-stones are known among the peasants as "stones of the dead."

If the cups on the slab at La Ferrassie were intended to receive offerings they would scarcely have been placed upside down and we are still in the dark as to their precise meaning.

Their great interest for us is in providing an additional example of the great antiquity of singular customs which have obtained a wide distribution over the globe. This finds a parallel in Von Baer's law, which asserts of animal species that those widely distributed in space are also widely distributed in time.

La Quina.—We now pass to the discoveries of M. Henri Martin,[1] whose exploration of the famous cave of La Quina has yielded such important results. In addition to a number of isolated bones representing no less than eighteen individuals, M. Martin has found and

[1] Henri Martin, "L'homme fossile de La Quina," *Arch. Morph.*, 1923, no. 15, 1923, and "Un crâne d'enfant néanderthalien du gisement de La Quina," *L'Anthr.*, xxxi, 1921, p. 331.

fully described two skulls, both in an excellent state of preservation: one is that of a young man of about twenty-five years of age, the other of a child of eight. Both are typically Neandertal, indeed that of the child is said to accentuate all the characters of the species. It is particularly interesting to observe that the child's skull is long-headed, for long-headed people of existing races pass through a brachycephalic stage in childhood.

The teeth of the young man have suffered from excessive wear, thus suggesting that vegetable food entered largely into his diet.[1] They are also encrusted with tartar, and bear signs which indicate that their owner suffered from gingivitis, but there is no trace of caries. He seems also to have been rather reckless in his use of a bone toothpick.

The human remains of La Quina are associated with the beautiful industry of that name. They belong to the closing days of the Mousterian age.

Thus it will be seen in conclusion that of the Mousterian people a great number of individuals (fifty or fifty-one) are known to us by their bodily remains. They are found scattered over Europe from Neandertal (N. 51° 15′ lat.) on the north to Gibraltar (N. 36° 7′ lat.) on the south, and from Šipka (long. 11° 20′ E.) on the east to Jersey (long. 5° 21′ W.) on the west, *i.e.* over 15° of latitude and 16° 41′ of longitude.

All belong to one and the same species, the extinct *Homo Neandertalensis*: of other species we have so far no sign.

This is an extraordinary fact, especially when we consider that there is good reason to believe that these people belong to a divergent branch of the family tree.

[1] M. Martin dissents from this conclusion, but the presence of grit which is necessary to marked abrasion is less likely to be found in a meat than a vegetable diet.

They are not our ancestors, but only avuncular relatives many times removed.

We may well ask ourselves, What has become of the descendants of Eoanthropus? and Whence were derived the men we are about to consider? men in the strictest sense of the term belonging to the one species which now alone possesses the earth.

In some remote region of the Old World our ancestors must certainly have been in existence, contemporaries of the species which disappeared from Europe at the close of the Mousterian times. To determine the position of this Garden of Eden is one of the great problems reserved for future inquirers.

CHAPTER VII

THE AUSTRALIAN ABORIGINES

LET us now turn to the Australians (Figs. 122 to 128), who in some of their characters so forcibly remind us of Neandertal man that at one time we ventured to style them the Mousterians of the Antipodes. We have now to admit, rather regretfully, that they can no longer be so epitomised. The two races belong to different species, and they differ not only in bodily structure but in material culture as well.

The Mousterian industry in stone is comparatively pure and homogeneous, with only a slight admixture of Acheulean forms; the Australian, on the other hand, is a heterogeneous collection to which almost all the Palæolithic and even some of the Neolithic industries have made their several contributions. Nevertheless the Australians offer such an excellent illustration of the culture and manner of life of a primitive hunting people, and throw so much light on much that would be otherwise obscure in the history of the upper Palæolithic age, that they may still retain their place as the subject of this chapter.[1]

[1] For the anatomical characters of the Australians see W. L. H. Duckworth, *Morphology and Anthropology*, Cambridge, 1904; W. Turner, "Report on the Human Crania and other Bones of the Skeleton," *Challenger Reports*, vol. x, 1884; vol. xvi, 1886; "Some Distinctive Characters of Human Structure," *Brit. Assoc.* (Toronto), 1897; "The Relation of the Dental Arcades in the Crania of Australian Aborigines," *Journ. Anat. and Phys.*, vol. xxv, 1891, p. 461; G. Sergi, "Tasmanier und Australier," *Arch. f. Anthrop. N.F.*, Bd. xi, 1912, p. 201; E. Frizze, "Untersuchungen

In stature they do not differ widely from the Mousterians, their average height being 1668 mm. (5·47 ft.), and that of Neandertal men, 1625 mm. (5·3 ft.). We have already mentioned some of the characters of the skull and face of the two species; as regards the hair, we can speak only of the Australians. Their hair is wavy, and they are therefore included in the same subdivision of mankind as ourselves, *i.e.* the Cymotrichi. They further resemble us in the abundant growth of hair over the lower part of the face.

In the arts they show a decided advance beyond the Tasmanians. The spear, though it still continues to be the most important weapon, is more complicated; it is frequently provided with barbs, and the head is not always of one piece with the shaft, but more usually a separate part made of hard wood or flaked stone (Fig. 129). They are without the bow, but, on the other hand, they possess a throwing stick for hurling the spear (Figs. 130, 131), and two kinds of boomerangs, one of

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am menschlichen Unterkiefer," *Arch. f. Anthrop. N.F.*, Bd. ix, 1910, p. 252; R. J. A. Berry, "The Sectional Anatomy of the Head of the Australian Aborigine," *Proc. Roy. Soc. Edin.*, 1911, vol. xxxi, pp. 604–626, 14 pls. A. W. D. Robertson, "Craniological Observations on . . . Australian Aboriginal Crania," *Proc. R. Soc. Edin.*, vol. xxxi, 1912, p. 1; Sollas, "On the Cranial and Facial Characters of the Neandertal Race," *Phil. Trans. B.*, vol. cxcix, 1907. For the general subject, A. W. Howitt, *The Native Tribes of South-East Australia*, London, 1904; Spencer and Gillen, *The Native Tribes of Central Australia*, London, 1899, and *The Northern Tribes of Central Australia*, London, 1904; W. E. Roth, *Ethnographical Studies*, London, 1897, and *Bulletins of North Queensland Ethnography;* R. Brough Smith, *The Aborigines of Victoria*, London, 1878; K. L. Parker, *The Euahlayi Tribe*, London, 1905, and N. W. Thomas, *Natives of Australia*, London, 1906. Interesting observations will be found in the works of the early explorers, *ex. gr.*, J. Hawkesworth, *An Account of the Voyages in the Southern Hemisphere*, London, 1773 (vol. iii contains an account of Captain Cook's voyage); Lt.-Col. Collins, *An Account of the English Colony of New South Wales*, London, 1804; G. Grey, *Journals of Two Expeditions of Discovery in North-West and Western Australia*, London, 1841, 2 vols.; and E. J. Eyre, *Journals of Expeditions of Discovery into Central Australia*, London, 1845, 2 vols.

which returns in its flight[1] (Figs. 132, 133). Their stone adzes and axes are provided with a haft (Fig. 134), and

FIG. 122.—Man of Arunta tribe, Central Australia. (After Spencer and Gillen.)

[1] On the flight of the boomerang, see G. T. Walker, "On Boomerangs," *Phil. Trans.*, 1897, cxc, p. 23, and *Nature*, 1901, lxiv, p. 338. The Egyptians used a boomerang. Schiaparelli has suggested that the

their stone knives with a wooden handle (Fig. 135). Shields of two kinds are used, one to ward off the blows of clubs and the other for defence against spears.

The art of manufacturing the stone implements has been carefully observed and described. The axe is made in more ways than one; sometimes a fragment of a jointed rock or a pebble from the brook is selected as

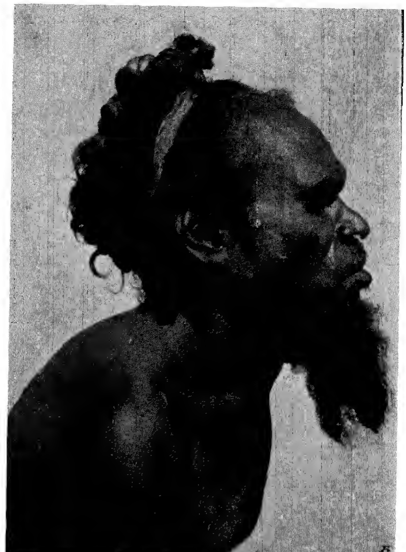

FIG. 123.—Man of Warramunga tribe, Central Australia. (After Spencer and Gillen.)

making a sufficient approach to the desired size and shape and then dressed to a sharp edge at one end, a small pebble being used as a hammer. In other cases the

"cajeta" described by Isidor of Seville was probably a boomerang:—Est genus Gallici teli, ex materia quam maxime lenta, quæ jacta quidem non longe propter gravitatem evolat, sed quo pervenit, vi nimia perfringit; quod si ab artifice mittatur, rursus redit ad eum qui misit.—Isidori Hispalensis, *Origg.*, xviii, see O. Z. Branca, *Nature*, *tom. cit.* p. 400.

work is begun by striking off a large flake from a block of stone; holding this in the left hand, with the conchoidal surface turned away from him, the operator

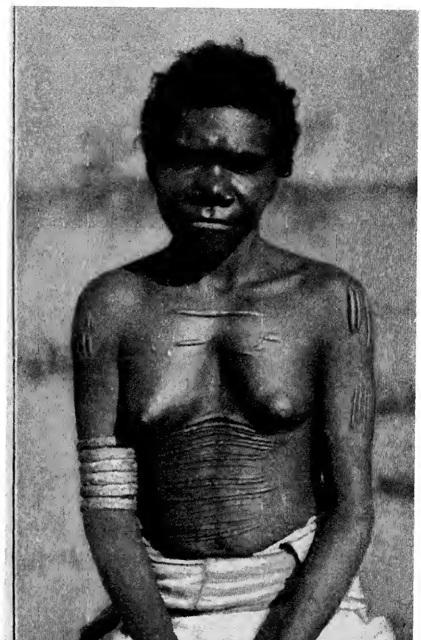

FIG. 124.—Man of the Worgaia tribe, Central Australia. (After Spencer and Gillen.)

then dresses it by blows delivered on the side facing him.[1]

The knife also is obtained by flaking; a block of stone about eight inches long by six broad, fairly flat at one

[1] In the north-west of Australia the flaking of stone spear-heads is also produced by pressure applied by means of a bone. Klaatsch says he has seen leaf-like points, recalling those of Solutré, being made in this way; H. Klaatsch, *Zeits. f. Ethnologie*, 1907, xxxix, p. 634.

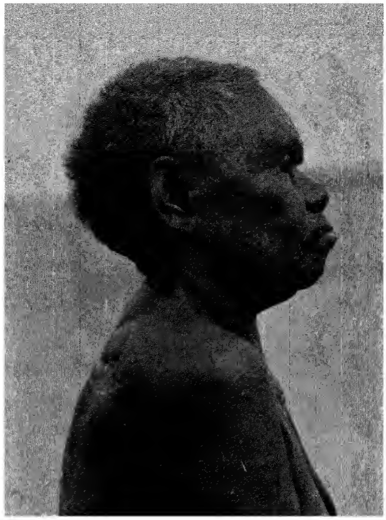

Fig. 125.—Elderly woman of the Kaitish tribe, Central Australia. (After Spencer and Gillen.)

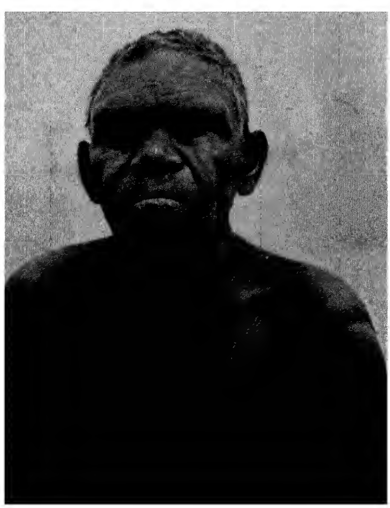

Fig. 126.—The woman of the preceding figure seen full face.[1] (After Spencer and Gillen.)

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[1] The hair is short because the women cut off their hair to make it into a waist-band for their husbands!

end and tapering to the other, is held upright against the ground and struck nearly vertically with smart blows near the edge (Fig. 135). In this way, long, thin laminæ, something like the blade of a dagger, are

FIG. 127.—Young woman wearing arm-bands and showing cicatrisation of the skin; Anula tribe, Central Australia. (After Spencer and Gillen.)

obtained, triangular in section, with a single broad face on one side and two narrower ones on the other; or an additional face may be present, as shown in the illustration (Fig. 136). As might be expected, they vary considerably in form; some are broad and lanceolate,

others narrow and elongate, but all are used for the same purposes.

It is said that for one they use there are hundreds they throw away.[1] This may help to explain the

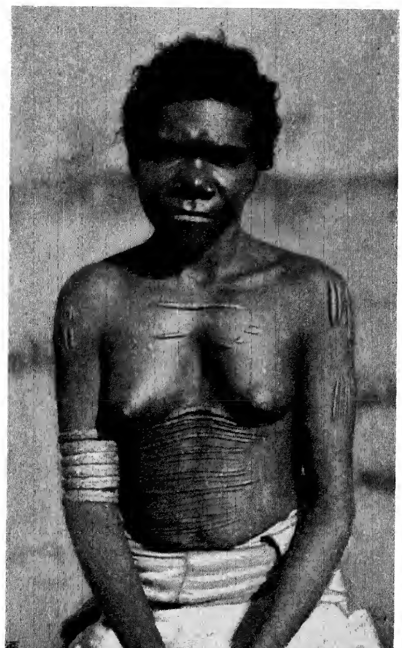


FIG. 128.—The same as in Fig. 127, seen full face. (After Spencer and Gillen.)

astonishing abundance in which ancient flint implements are met with in some localities at home.

These flakes resemble in many respects those which we shall encounter later on in the Magdalenian stage; but the Australians make other flaked implements,

[1] Spencer and Gillen, *The Northern Tribes of Central Australia*, p. 642; W. E. Roth, *Bull. North Queensland*, no. 7, p. 16.

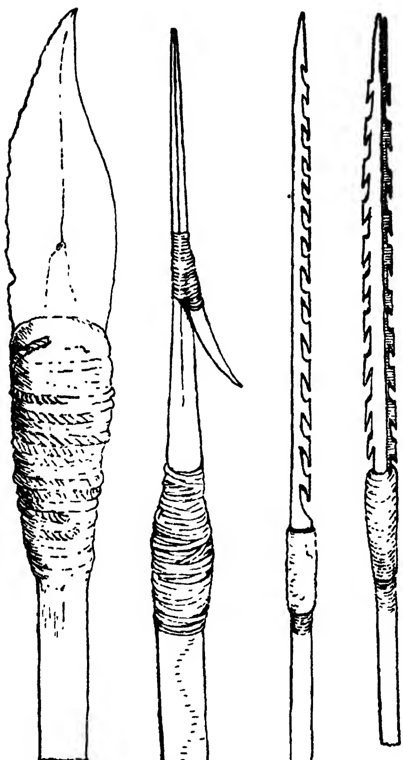


Fig. 129.—Various forms of spear-head, Central Australia.

(After Spencer and Gillen.)

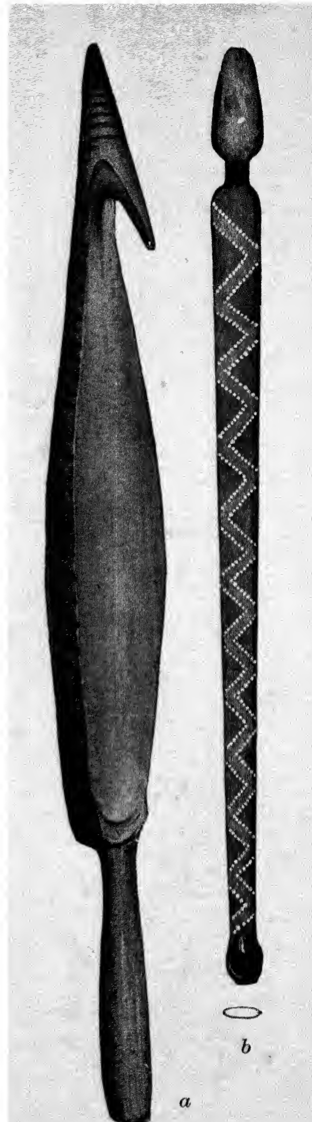


Fig. 130.—Spear-throwers. *a.* Supposed to possess strong magic properties (South-East Australia). (After Howitt.) *b.* Decorated spear-thrower, Warramunga tribe (Central Australia). (After Spencer and Gillen.) *b* is inverted.

some of which are excellent examples of Solutrean workmanship.

Spencer and Gillen, in describing the manufacture

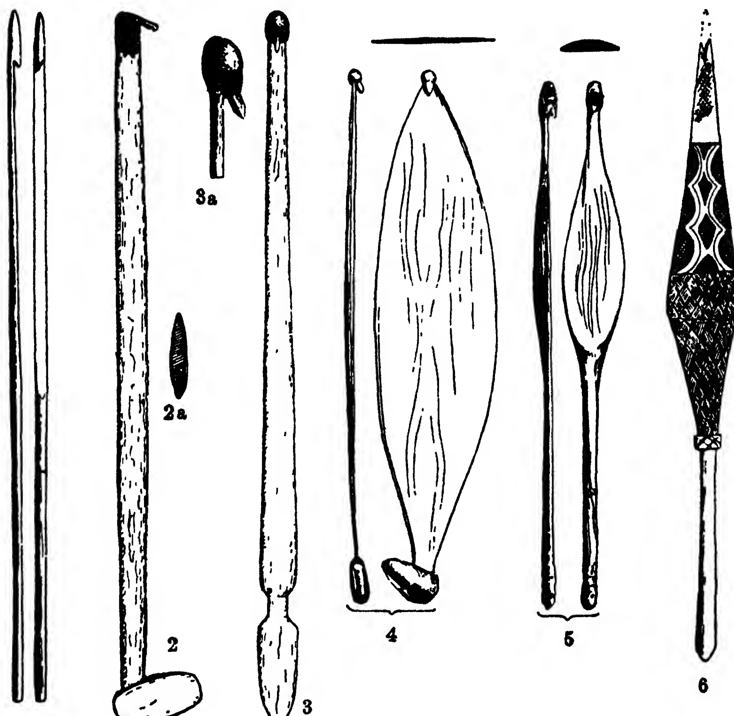


FIG. 131.—Different forms of spear-thrower. 1, simple, rod-like; 2, blade-like, with the tooth projecting from the edge (in the plane of the blade), sometimes, as in the figure, with a plate of shell at the haft; 3, blade-like, with the tooth projecting from the face of the blade, narrow, tapering towards the end; 4, similar to 3, but broad; 5, 6, intermediate forms, with a long rod-like handle and a short, rather narrow, blade. There is a variety not shown here, which resembles 3, but is not tapering: we will distinguish it as 4*a*. (After von Luschan.)

of the Australian stone implements, remark that "some men are much more skilful than others." To this it may be added that in general the natives differ among themselves in physical and intellectual endowment

almost as widely as civilised races. But when we turn to Palæolithic man, similar differences as regards workmanship reveal themselves. No one can look through

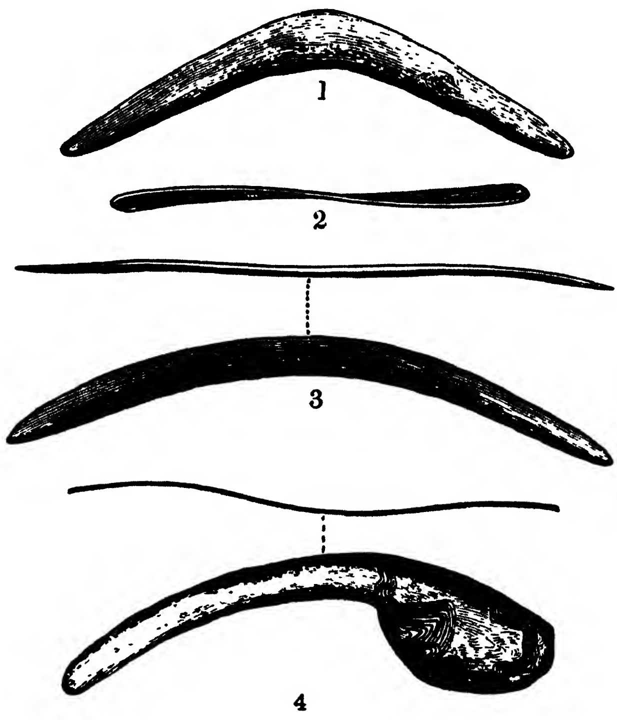


FIG. 132.—Boomerangs. 1. A returning boomerang (Wonguin). 2. The same seen edgeways, to show the twist in its form; the twist is exaggerated in the diagram—it does not amount to more than 2° or 3°. 3. A non-returning boomerang (Barngeet) shown edgeways above. There is no regular twist. 4. A boomerang (Li-lil) which is used for fighting, and seldom thrown, shown edgeways above. (After R. Brough Smith.)

a collection of implements from the same locality, even when these are Chellean or Acheulean bouchers, without being struck with their extraordinary difference in style and finish: in some cases we seem to have before us the work of a novice or mere bungler, in others our admira-

tion is aroused by truth in form and accuracy in detail, where every stroke speaks of the master hand. Thus

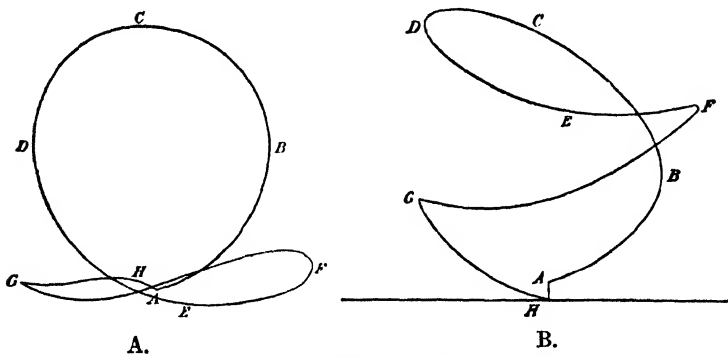


FIG. 133.—The flight of a returning boomerang (*A* in plan, *B* in elevation). This represents the most complicated flight obtained by Mr. G. T. Walker in his experiments; when thrown by the natives of Australia the boomerang sometimes performs truly marvellous flights. In one case recorded by Howitt it described five circles in the air, and covered a course of 90 metres before returning.

the earliest records of our kind, as much as the facts of daily experience, offer a contradiction to that amazing doctrine which asserts the equality of individual men.

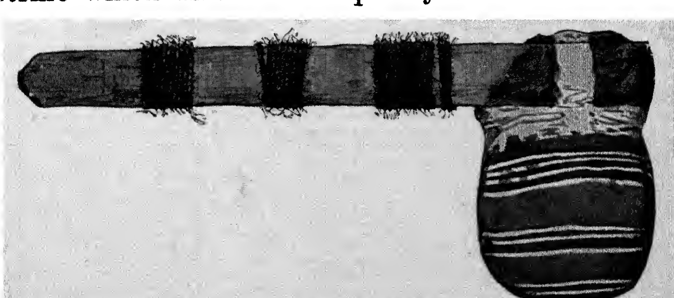
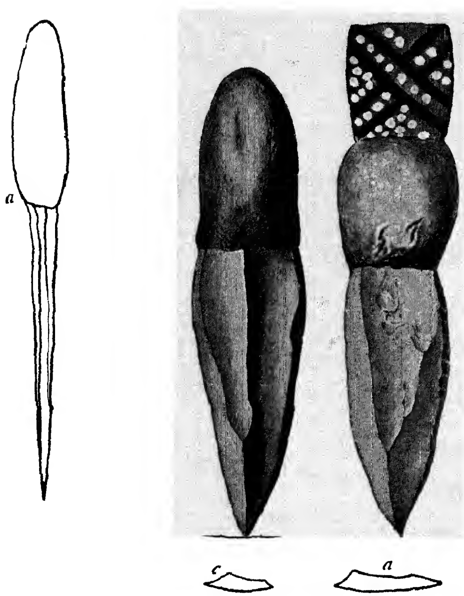


FIG. 134.—Stone axe decorated with line ornament (Central Australia). (After Spencer and Gillen.)

The same observers also inform us that there are certain localities where the best knives are made, and that for every flake considered good enough to use, at

least a score are discarded. This also finds a parallel in Palæolithic times; for in several localities, both in



1. 2.

Fig. 135.—Stone knives. 1. With a resin handle, and an unusually thin blade: *a* seen sideways, *b* and *c* transverse sections, taken one-third and two-thirds down the blade. 2. With a wooden handle attached by resin and decorated with pigment; *a*, transverse section (Warramunga tribe, Central Australia). (After Spencer and Gillen.)

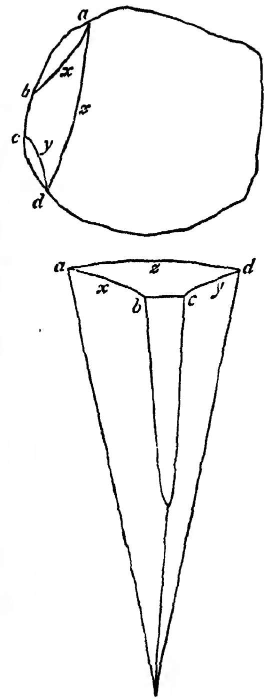


Fig. 136.—Manufacture of stone knives. The upper diagram shows the block from which the flakes are detached. The first blow, struck at *x*, detaches the chip *a b*, the next, struck at *y*, detaches the chip *c d*; the last blow, at *z*, takes off the flake shown in the figure below. (Central Australia.) (After Spencer and Gillen.)

England and abroad, factories of bouchers and other implements have been unearthed, where every stage,

from the rough nodule to the finished product, has been observed, as well as abundant wastrels.

Some of the Australian axes, made of close-grained

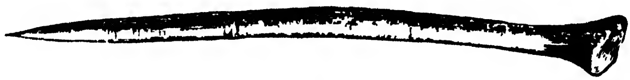


FIG. 137.—Bone awl. (After R. Brough Smith.)

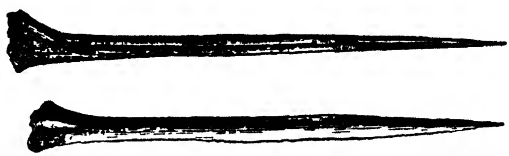


FIG. 138.—Bone pins. (After R. Brough Smith.)

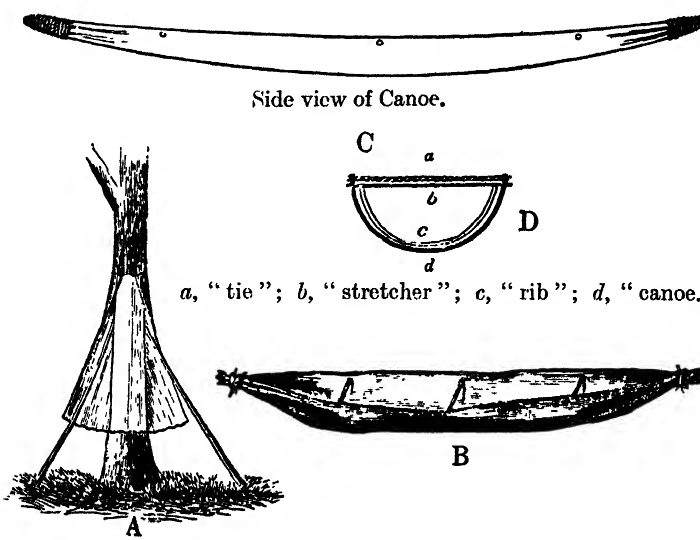


FIG. 139.—The bark-boat. *A*, to show how the bark is removed in one piece from the Eucalyptus tree; *B*, the finished boat; *C*, a slightly different form of bark-boat, with ties and ribs as well as struts, as shown in the transverse section *D*. (After R. Brough Smith.)

diorite, are ground down, after they have been chipped into shape, on a flat slab of sandstone, with the aid of sand and water. Polished implements such as these

are supposed to be the exclusive characteristic of the Neolithic period; but as the Australians are still in a Palæolithic stage of culture, they present us in this case with an exception, for which various explanations may be found.[1]

FIG. 140.—Sewn bark canoe; Arunta tribe. (After Spencer and Gillen.)

Bone is used for some implements, such as awls (Fig. 137) and gouges; the fibula of the kangaroo or emu when ground down to a fine point makes an excellent awl, which is used for piercing holes in skins, preparatory to "sewing" them together with the sinews of animals. Bone pins (Fig. 138) are made for pegging down the skins while drying. The tooth of an opossum is used for engraving. We shall meet with bone implements in deposits of the Upper Palæolithic period.

The Australians are quite at home in the water; they are expert swimmers and divers, and most tribes, but not all, know how to make and handle several kinds of water-going craft. The rudest of these is a raft, made up of bundles of rushes, such as the Tasmanians possessed. Another raft is constructed of the trunks of trees; two or three, 15 to 20 feet in length, being lashed together: on this two or three persons may be paddled or punted across a river. Rafts were probably used at a very early stage of human culture; but

[1] See p. 290.

the bark-boat (Fig. 139) which the Australians also possess, takes us at once to a higher level of development. This is generally made by carefully removing with a stone

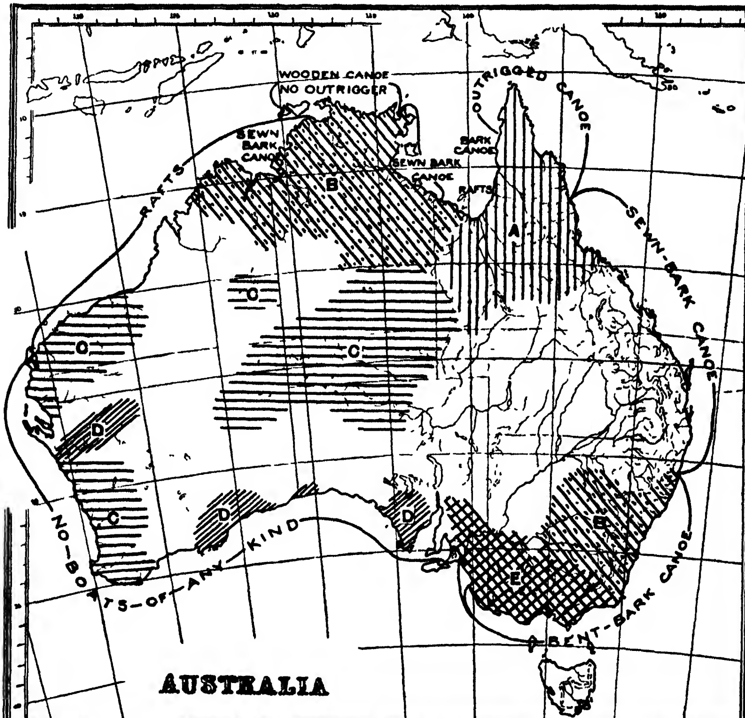


FIG. 141.—Map of the distribution of the different kinds of spear-throwers and water craft. (Based on Curr and Graebner.) Spear-throwers A, forms like 2, Fig. 131; B, like 3, Fig. 131; C, like 4, Fig. 131; D, form 4a; E, like 5 and 6, Fig. 131. Forms like 1, Fig. 131, are also found in B and E. In the area left blank on the eastern half of the continent there are many isolated areas where the spear-thrower does not exist. The outrigged canoe of Northern Queensland has no doubt been introduced from New Guinea.

axe the bark of a single tree, generally a species of Eucalyptus known as the red gum; struts are placed inside to open it out and it is propped up by sticks placed at the bow and stern; the ends are ingeniously tied

up with string furnished from the bark of another Eucalyptus (stringy bark), and after being left to dry for about a fortnight the boat is ready to be launched. When fishing, a lump of clay is sometimes placed at the bottom of the canoe, and on this a fire is lighted, which gives warmth to the fishermen and serves to cook

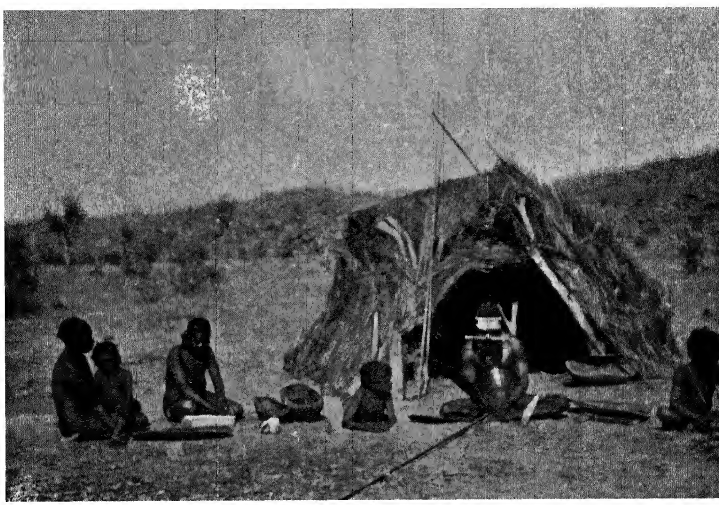


FIG. 142.—Native hut or Wurley. The family are seen seated in front of the hut, with their implements about; the man (on the right) is wearing his nose-pin (Central Australia). (After Spencer and Gillen.)

his catch. Clay is also used for caulking the ends. A still further advance is seen in the sewn bark canoe, which is made of several sheets of bark sewn together and also to what for want of a better name we may call the "gunnel."

Their huts (Fig. 142), though very rude, show some advance on the Tasmanian wind-screen[1]; but they are seldom occupied for more than a few days at a time,

[1] Wind-screens very similar to the Tasmanian are also in general use.

unless fish is plentiful, or certain vegetables are in season. In some cases caves or rock-shelters are used as temporary dwelling-places.

Though accustomed to wander in a state of nakedness, except for a hip girdle, in which the men carry their weapons and to which the unmarried girls attach a narrow little apron or fringe made of strips of fur or strings of hair (Fig. 143), yet in camp or on cold nights they put on warm clothes. These are made from the skins of the kangaroo, wallaby, opossum, native "bear" and native "cat"; 30 or 40 opossum

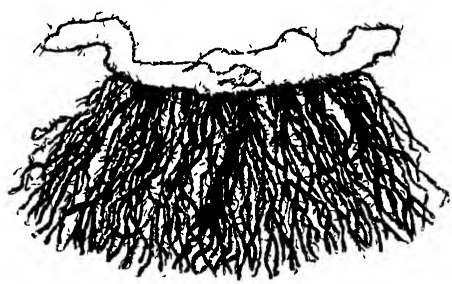


FIG. 143.—Woman's apron made of human hair; Arunta tribe, Central Australia. (After Spencer and Gillen.)

skins are required to make a cloak for an adult. After the skin is removed from the animal it is pegged out fairly tight on a hard patch of ground, and, when dry, trimmed into a rectangular shape with a stone knife; the inside is then carefully gone over with a stone scraper, to remove all traces of fat and flesh; and finally a mixture of grease and red ochre is well rubbed in. Holes are pricked with a bone awl, and through these, fine sinews taken from the animal which has supplied the fell can be threaded; in this primitive fashion the skins are "sewn" together.

Besides the cloak, which serves for use, they wear

many adornments; necklaces of various kinds, among which may be specially mentioned those made of univalve shells or kangaroo teeth (Fig. 144). The shells are perforated by a stone point and threaded together by passing a string through the mouth of the shell and the perforation; as a consequence, they do not hang in regular arrangement, but point in all directions.

Among adornments may perhaps be reckoned the nose-pin[1] (Fig. 145), which is thrust through the nasal

FIG. 144.—Neck-band with incisor teeth of kangaroo (Central Australia). (After Spencer and Gillen.)

septum, but from this the path is easy to mutilations, some at least of which have a religious meaning; one or more front teeth are knocked out as part of an initiation ceremony, and many raised scars which disfigure the body are the result of self-inflicted wounds while mourning the dead. The women often amputate

[1] Captain Cook says of this—"It is 5 or 6 inches long, as thick as a man's finger, reaches right across the face and prevents them breathing freely through the nostrils. Our seamen called it their 'spritsail yard.'" —J. Hawkesworth, *Voyages in the Southern Hemisphere*, London, 1773, iii, p. 633. The "spritsail yard" is also in use among some of the North American Indians, some of the tribes in New Guinea, and elsewhere. Barrow observed it among the Bushmen of South Africa.

two joints of one of their little fingers, the left in some tribes, in others the right, for what reason is not clear.[1]

The Australians, like the Tasmanians, anoint themselves and dress their hair with a mixture of grease and red ochre.[2] A wooden rod about the size and shape of a lead pencil serves for a comb.

Pigments are largely employed for decorative and other purposes. The colours generally used are red, yellow, white, grey, and black, obtained respectively from red and yellow ochre, pipeclay, and burnt gypsum (plaster of Paris), micaceous iron ore, manganese oxides, and charcoal.

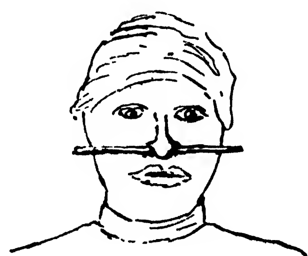


FIG. 145.

Red ochre, which is in great demand, has a special interest for us, since it was one of the commonest pigments used by the ancient cave men of Europe. It is supposed to serve in some ceremonies as a substitute for human blood. It generally occurs at the outcrop of mineral veins, and certain localities are noted for

[1] In some cases it is a symbol of dedication to a particular industry, thus in the Port Stephen tribe a mother marks her new-born baby girl as a fisherwoman by cutting off two joints of its little finger, choosing the right hand; so, too, in the Dalebura tribe, except that the left hand is chosen. A. W. Howitt, *op. cit.* pp. 746–747. Phillip, speaking of tribes met with on his voyage, remarks that "the women in general had lost two joints from the little finger of the left hand." A. Phillip, *The Voyage of Governor Phillip to Botany Bay*, London, 4to, 1789. Mr. Etheridge states that in one tribe a thread is tied round the joint of the finger and tightened from time to time till the segment above the joint drops off. This, he says, is done when a girl is betrothed, so that the ligature is a primitive kind of engagement ring! R. Etheridge, junr., "A Remarkable Rock-shelter in the Milton District, N.S.W.," *Rec. Austr. Mus.*, 1903–5, v, p. 80 *et seq.*

[2] This served as a protection against vermin and was evidently very efficacious. Fleas, not to speak of other insects, are said to have been unknown among the aborigines till introduced by the white man.

yielding the best quality. Tribes will send a long distance to procure it from these places. Howitt tells us of one tribe (Dieri) which at certain times of the year dispatched an expedition of 70 or 80 picked men under experienced leaders, who, if necessary, fought their way across country to the "mines," some 300 miles off. The members of these expeditions are distinguished by bands of white and yellow, painted transversely across the body. The ochre is dug out of the "mine" and kneaded into large cakes weighing when dry from 70 to 80 pounds. The men carry these away on their heads. The "mine" is the property of the tribes who own the land in which it occurs, and they are willing enough to dispose of the ochre by barter.

Barter is carried on over a wide extent of country. In some localities there are quarries which furnish such excellent sandstone for grinding purposes that distant tribes, 300 miles away, send commodities in exchange for it; similar distances are traversed to obtain the Pituri plant, and red ochre also, as just mentioned. Of particular interest is the existence of a barter in manufactured articles, such as exists between one tribe which is noted for making good spears, and another equally noted for making good shields. This is barter based on a subdivision of labour.

The Australian is an able and sagacious hunter; whatever in the living world is capable of affording food seems to be known to him as well as the means of obtaining it; he is familiar with all the ways of wild animals and skilled in a variety of devices for outwitting them.

The marsupials, which take the place of the higher mammals in his environment, furnish him with excellent meat. The largest of them is the kangaroo (a general

name, for there are at least fifty species of this animal); it is circumvented and captured in a variety of ways, but the noblest sport is the hunt pure and simple, practised after the same fashion as the pursuit of the wild goat by the Hawaiians.[1] The hunter follows the animal, and performs what seems at first sight the incredible feat of running it down; of course the kangaroo, like the wild goat, is much swifter of foot than the hunter, but it has not the same staying power, and so by keeping it constantly on the run it becomes at length completely "blown" and exhausted. It is only men of exceptional endurance, however, who can run down the kangaroo. The sinews of the hind legs and tail make useful thread; they are carefully extracted and wound tight on a stick for future use. The opossum is good eating and easily caught; so is the wombat, though a good deal of labour may be expended in digging it out of its burrow with a mere stick for a spade; it weighs as much as 30 pounds, or even more. The native "bear," a sluggish animal living in trees, is also easily caught; it weighs up to 40 pounds, and tastes like pork. All the other marsupials, down to the kangaroo rat, are also used for food. Almost the only higher mammals found in Australia are the dingo,[2] or native

[1] C. E. Dutton, "Hawaiian Volcanoes," *U.S. Geol. Surv. IV Ann. Rep.*, 1882–1883, p. 137.

[2] The dingo, which is about as large as a sheep dog, with long legs and a bushy tail, is also tamed and used for hunting the kangaroo. How it got into Australia is a question which has been much discussed; most probably the aborigines brought it with them. Nehring, who has given much attention to the origin of domesticated animals, concludes from an examination of the skull that the dingo is closely related to the Indian dog (*Canis pallipes*). The skull of the dog prevalent in Europe during the Bronze Age is also said to be almost identical with that of *C. pallipes*. See A. Nehring, "Die Abstammung der Hundenrassen," *Zoologisches Jahrbuch*, iii; A. von Pelzeln, *ibid.*, i, p. 225; Brehm, *Illust. Thierleben*, 2nd ed., i, 568. At Lake Timboon, W. Victoria, the bones of the dingo are found fossil along with those of the Tasmanian devil (now extinct in Australia) and an extinct species of kangaroo.

dog, and the rat; both are eaten; so is the so-called "porcupine" (Echidna), one of the lowest of the mammals.

The diversity of bird life is remarkable; in proportion to its size Australia contains probably more species of birds than any other continent; all serve for food, from the great emu down to the little honey-eaters; after the emu, the most important are the "turkey" (Otis), ducks, pigeons, cockatoos, and black swans. The eggs of many kinds of birds are collected by the women.

Turtles, snakes, lizards, and other reptiles, as well as frogs, are delicacies.

Fish are plentiful and good; one of the most famous is the Murray cod (Oligocorus): both in texture and flavour its flesh is excellent—*crede experto!*

The Australians, unlike the Tasmanians, are acquainted with the art of fishing, using for this purpose special spears provided with several points, or, in some parts of the continent, actual fish-hooks, which are made of wood or shell.

Weirs are also employed, some temporary, others permanent. A remarkable instance of a permanent weir is the "Breewarina" on the upper Darling river; this is a complicated labyrinth of stone walls, three or four feet in height, which extends for 100 yards up stream. The fish lose their way in its mazes and are then caught by hand.

The insect world affords an important supply of food; many kinds of grubs are eaten, sometimes raw, sometimes cooked, certain kinds of moths are greedily devoured,[1] and the pupæ of ants are a kind of staple. The bees make their hives in trees, where they are diffi-

[1] When roasted they taste like an unpeeled almond.—E. J. Eyre, *Discoveries in Central Australia*, London, 1845.

cult to find; the native therefore looks about till he sees a bee busily gathering honey from the flowers, he catches it, fixes a little fluff of down to its body, sets it free, and then follows it to its home.

The sea furnishes various crustacea, shell-fish and sea-cucumbers (Holothuria).[1] Immense mounds of shells, the remains of ancient feasts, are found along the coast. A stranded whale is a godsend: the natives eat their way through it--a lengthy enterprise, but they like their food high.

The number of plants which yield nourishment from one part or another is very great. Yams, of which there are two species, are among the most important; they are by no means a bad substitute for potatoes. A heavy wooden stick, chisel-like at one end and pointed at the other, is used by the women for digging up these and other roots. On occasion, as in household brawls, it comes in handy as a weapon. There is a truffle (Mylitta) which grows to a large size; it is known as native bread. Some of the plants yield manna, an exudation consisting chiefly of grape sugar.

The seeds of certain plants, especially the purslane (*Portulaca oleracea*), are collected by the women, who grind them down between two stones into a coarse meal, which is made into paste with water; it may be eaten raw or baked into cakes. The "seeds" of the nardoo, a cryptogam, are similarly treated, but the amount of nourishment they afford is trifling; it was on this food that Burke and Wills starved. The bunya-bunya, a giant Araucaria, affords a favourite food; in the season, when its seeds are ripe, the surrounding tribes wander into the bunya-bunya land and keep high festival.

A kind of arrowroot is made from the roots of the

[1] Brough Smith, *tom. cit.*, p. 205.

wangoora, a species of Ipomœa; the poisonous bitter principle is washed away by water, leaving a wholesome starch.

The native cooking is not to be despised; those who prefer a grilled chop to a made dish would appreciate the native broiled meat done over the ashes of a wood fire.

The usual beverage is water; sometimes sweetened with honey obtained by crushing up in it the bodies of the honey ants or by infusing the flowers of the honeysuckle, or the fruit of the pandanus, or manna, or, again, the refuse comb of a bee hive. The sweetened water is of course very liable to fermentation, and may consequently acquire exhilarating properties; indeed, when sufficient honey is added from the comb it may make a really strong drink.

In dry districts the native can live where a white man would perish; he has discovered how to obtain water from the roots of certain trees; they are exposed by clearing away the soil, and pieces three or four feet in length are then cut out. These are set upright against the trunk of a tree so that the water may drain out into a vessel placed underneath. As much as a quart of water may be obtained from ten feet of a root two or three inches in diameter.

The Australian smokes, using the leaves of a large spreading tree (Eugenia) for tobacco, and a hollow bamboo for a pipe.[1] He also chews[2]: the leaves and twigs of the Pituri plant (*Duboisia Hopwoodi*) providing him with a very pleasant narcotic.

[1] It is singular that tobacco smoking, which is so widely prevalent among hunting races all over the world, should have been for so long unknown in Europe. It does not seem to have been discovered till Columbus first set foot in Cuba, Oct., 1492, when some of his officers observed the natives smoking cigars.

[2] This did not escape the notice of Captain Cook; he says, "they held leaves of some sort in their mouth as a European does tobacco and an East Indian betele."—J. Hawkesworth. *tom. cit.*, p. 637.

Cannibalism is not generally practised, except as part of some religious ceremony, or on very special occasions. Enemies are sometimes eaten, and their bones are broken afterwards to prevent their coming together again and avenging their owners. There seems to be a general agreement as to the excellence of human flesh as a viand: in the opinion of one native epicure it tastes much better than beef.

It will be seen from this short abstract that the Australian knows how to make the most of his environment. In the old days he enjoyed a great variety of good cheer, and his life in a simple way was on the whole a happy one; it would have been happier but for one haunting fear, the constant suspicion, not without reason, that some one or other of his fellows was ever on the watch seeking to bring about his death by magic.

In describing the life of the Australian aborigines we have no reason to lament the deficiency of our information. The admirable investigations of many skilled observers, but especially Howitt, Spencer, and Gillen, have provided us with such a wealth of material that our difficulty is to choose. We must, indeed, pass lightly over whole provinces of knowledge, in order to treat a little more fully those parts of the subject which are more directly concerned with our Palæolithic hunters.

Our first impression on commencing the study of these primitive people is that of surprise at the extraordinary extent to which their life is governed by rule. Law and order are secured by custom and enforced as strictly as in some civilised lands. A moral code, different no doubt in many respects from our own, is universally recognised; its infringement is attended by public reprobation and often punished with extreme severity, not infrequently with death.

Even etiquette or the code of good manners is not unknown. Thus among the Narrinyeri on leaving your host you say "good-bye," or rather, "ngingte luo," which means "please sit still," the equivalent of "ne vous dérangez pas," and the reply is "nginte ngoppun," or "do thou walk," thus speeding the parting guest. Again, it is considered very rude to hold a private conversation in the presence of others.

The tribal organisation is complicated to a remarkable degree, and differs from tribe to tribe. All that we can do in a brief abstract is to give an impressionist view of the general scheme.

Totemism.—But preparatory to this it will be better to consider first the more intimate life of the Australian, beginning with that strange nexus of beliefs known as totemism. Australia is said to be the home of the totem, and nowhere certainly is it more universally present or more closely bound up with the whole life of the individual and the community.

We may define a totem as some natural object or phenomenon with which a person or a group of persons is associated in close and mystic union. It is generally some kind of animal, a hawk, a snake, or a rat, for instance, but it may be some kind of plant, and more rarely it is something not animate at all, such as red ochre, or a cloud, or fire, or it may be even a mere phase of things, such as a season of the year.[1]

It is very difficult, almost impossible, for us to enter into the spirit of totemism, but it is something very real to the primitive hunter. If we ask a man of a particular totem, say the Crow, what the Crow means to him, he will reply that he *is* the Crow, or that he possesses the Crow, but also that the Crow

[1] But it is never a single object and is thus distinguished from a fetich.

possesses him; or he will say that he and the Crow are both of the same flesh, or that the Crow is his elder brother.

Sometimes—as we might expect—the man is forbidden in any way to ill-treat or to kill and eat his totem; and if in times of scarcity he does so under dire necessity, he must kill it gently, without hurting it more than can be helped.

Those who have a cloud or a season for their totem are not called upon to exercise so much self-denial, though as they are almost sure to have some other totem as well they will not escape altogether.

When the totem is treated with proper respect it reciprocates, helping its younger brother when in difficulties, or warning him of impending danger. If ill-treated it retaliates, inflicting disease or death upon the offender.

Besides totems which belong exclusively to one individual (personal totem) there are others which are the common possession of a family group (group totems) or of a collection of groups (class totem and phratry totem) or, most singular of all, of the members of one sex (sex totem); thus among the Wotjobaluk tribe the bat is the brother of all the men, and a night-jar the sister of all the women.

Since the totem of a group is the brother of all the members of the group, these are also brothers of one another, and so strongly felt is this bond of relationship that men of the same totem, if they happen to meet on opposite sides in battle, will not knowingly hurt one another.

In spite of much ingenious guessing we are still without any real explanation of the origin of totemism.[1]

[1] A. Lang, *The Secret of the Totem*, London, 1905. Sir J. G. Frazer. *Totemism and Exogamy*, London, 1910, 4 vols. A. van Gennep, *Mythes et Légendes d'Australie*, Paris. 1905, p. lxi.

It certainly dates from a very remote past, and some have supposed from a time when men had not yet learnt to distinguish clearly between the phenomena of the inner and the outer world or even between the lower animals and themselves.

Even if this were so, and we may well have our doubts, it would not help us to understand how a man could confuse himself with, say, a season of the year; but it may also be urged that the disposition of the primitive hunter to attribute mysterious powers to the phenomena of the world around him does not carry with it so strange an intellectual incapacity as is supposed. Even among a people assumed to be so enlightened as ourselves a mystic relation with fellow existences may impress itself upon the thought of the more subtle spirits, thus Browning :—

> "Many a thrill
> Of kinship, I confess to, with the powers
> Called Nature : animate, inanimate,
> In parts or in the whole, there's something there
> Man-like, that somehow meets the man in me."

The hunter is by no means so stupid as some writers would have us believe. Sir J. G. Frazer cites approvingly the evidence of John Campbell, a missionary in South Africa, who asserts that a Bushman whom he questioned, "could not state any difference between a man and a brute," and that "he did not know but a buffalo might shoot with bow and arrows as well as a man, if he had them." When reading Mr. Campbell's book I obtained the impression, which this citation confirmed, that he was rather a stupid man, and I am inclined to agree with the native; for a buffalo who had got so far as to have bows and arrows might go much further.

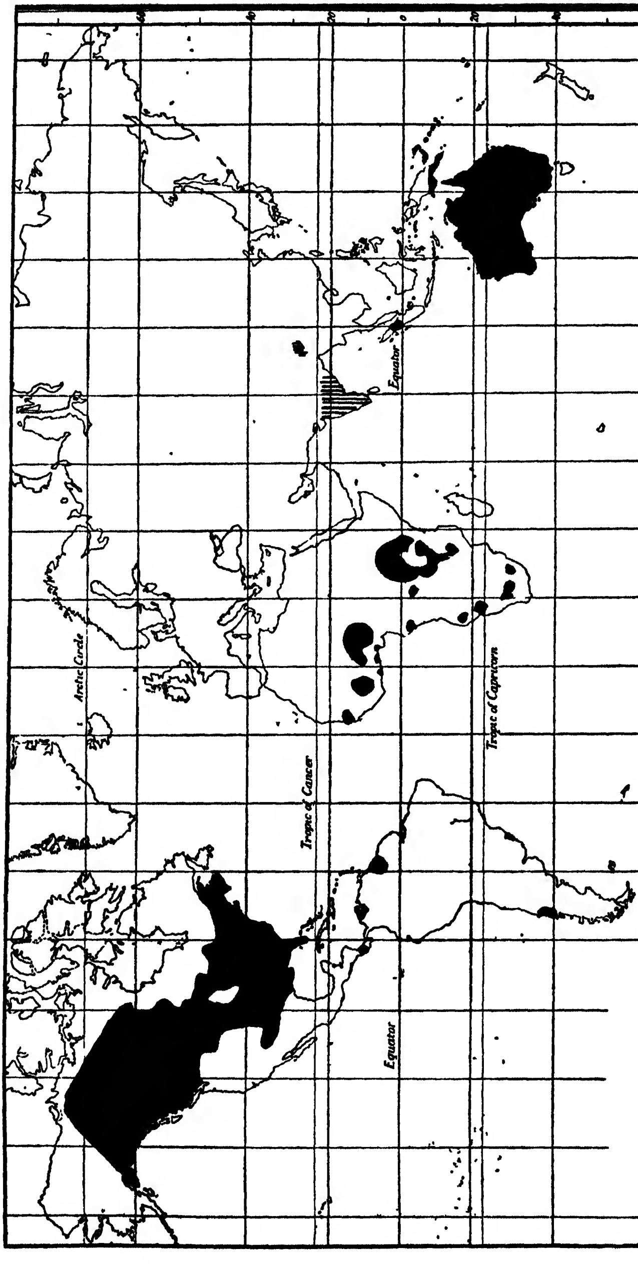


FIG. 146.—Distribution of Totemism. Fully developed in regions marked black; traces in regions marked with vertical lines. (After Frazer.)

It would not repay us to follow these inquiries further and we may content ourselves for the present with accepting totemism as a fact.

Totemism exists among all the tribes of Australia without exception, and it seems extremely probable that the aborigines brought their belief with them when they first occupied the country. But totemism is not confined to Australia; it is widely spread over North America—the word "totem" comes from that part of the world—it occurs in South America, as well as among numerous tribes in Africa; traces of it are to be found among the hill tribes of India and it is met with also in Fiji, New Guinea and elsewhere (Map, Fig. 146).

When a custom is thus widely, but discontinuously, distributed we may conclude that it must be very ancient. If it originated once for all at a single centre (monophyletic origin) it must on any hypothesis have taken a long time to reach places so remote from one another as North America, Africa, and Australia. Of course it is possible that the same or a similar idea may have occurred independently to men of different races at different times and in different places (polyphyletic origin) and then this argument fails. But if it is difficult to conceive how such ideas as are involved in totemism originated at all, it is still more difficult to understand how they should have arisen repeatedly and have developed in much the same way among races evolving independently in different environments. It is at least simpler to suppose that all totemistic beliefs have a common source; and it is not impossible that the fundamental idea may have arisen somewhere in Eurasia during Palæolithic times and may have since been carried by migrating races or intertribal communication to remote parts of the world.

Circumcision.—It will be convenient to mention here another singular and ancient custom which prevails in Australia, *i.e.* circumcision. It commonly forms part of an initiation ceremony and there is some reason to suppose that it may have originated as one of the rites by which the boy was "made into a man."

The custom is almost as widely spread throughout the world as totemism; we meet with it among many African tribes, the Zulu Xosa and Bechuana, the Fanti, Mandingos, Gallas, and Falashas; it is found in Madagascar, many of the Pacific Islands, such as the New Hebrides, New Caledonia, and Fiji, as well as among several tribes in America, such as the Aztecs, the Caribs of Orinoco, and the Tacunas of the Amazon.

This might lead us to suppose that it is very ancient, and we find indeed that it was practised by the ancient Egyptians as far back as the Fourth Dynasty [1] (at least 3000 B.C.). There seems to be no reason to doubt that Herodotus was right when he asserted that the custom had spread from Egypt to the Ethiopians, the Phœnicians and the Jews. But its origin lies probably far beyond the date of the Fourth Dynasty, and it may have been practised by some of the hunters of the later Palæolithic age.

In Australia, where it is frequently associated with a still more barbarous mutilation, known as subincision, which leads to physiological derangements, it is not universally distributed; as will be seen from the map (Fig. 157), it is confined to an area which extends in a broad band from the north to the south coast across the middle of the continent,[2] but it is absent

[1] See Canon Driver, *The Book of Genesis*, 5th edition, 1906, p. 189 *et seq.*

[2] It is curious to note the disdain with which the circumcised look down on the uncircumcised tribes in contact with them, and the still greater

from the whole of the fertile eastern region as well as from a narrow littoral belt in the west.

This limited distribution, taken in conjunction with other evidence, seems to show that it was introduced at a later date than totemism. To those who believe that Australia was peopled by successive waves of immigration from the north this will seem perfectly natural; but we are not limited to this hypothesis, and it is quite possible that the rite has been passed on from one tribe to another without any general movement of the population. The tribes of the northern coast might easily be infected with the practice by their neighbours in New Guinea, who visit them for trading purposes in their canoes, and thence, if we may conclude anything from native legends, it was carried southwards by a kind of missionary propaganda. If this be so, it is evident that Australia, notwithstanding its isolation, has not remained wholly closed to influences coming from the more northern world.

The Tribal Unit.—The fundamental unit of an Australian tribe is said to be a "local group,"[1] this may be identical with a family or it may include two or three families; it possesses exclusive rights over a well-defined hunting ground.[2] A number of these groups occupying a definite territory may form a clan and a number of clans form the tribe.

The older men in each local group exercise authority

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disdain of the subincised for those who have not undergone this additional ordeal. So, too, the Egyptians despised the Jews as an uncircumcised people; and the Jews, when they had acquired the rite, the Philistines; while at the present day, "uncircumcised dog" is one of the flowers of speech attributed to the Mahomedan in addressing a Christian.

[1] B. Malinowski, *The Family among the Australian Aborigines*, London, 1913.

[2] The extravagant demands made by a hunting life on the land is shown by the fact that in a fertile district it required more than 100 square miles to support 300 people.

over the women and younger men, and one of them takes precedence of his fellows; he is the headman of the group.

The headmen of the various local groups are collectively the headmen of the tribe, and one of them, sometimes by inheritance, but usually by the exercise of his natural gifts, occupies a superior position to the rest. He is in a broad but true sense the chief of the tribe. Each totem group also possesses its headman. In the tribal councils the chief speaks first and is followed by the heads of totems.

The medicine men have no influence beyond that which they can obtain by their own powers; they are the priests, wizards, and doctors of the tribe. Their dominion lies in the occult; they see visions, dream dreams, interpret omens, and exercise, not altogether without fraudulent devices, genuine magic powers.

Various offices may be combined in the same person, thus Jalina piramurana, the chief of the Dieri tribe, was also the head of the Kumaura totem and at the same time a powerful wizard. He is described as a man of polished manners (known as "the Frenchman" among the settlers), of persuasive eloquence, skilful and brave in war. He gave judgement in disputes, and his decisions were accepted as final. Neighbouring tribes sent him presents, and these he distributed among his people, in order, it is said, to prevent jealousy. He decided when tribal ceremonies were to be held, and sent his messengers for a hundred miles round to summon the tribes to attend them and to consult on intertribal affairs.

Every baby born into a tribe presents a problem which must be solved without delay. The question is whether it shall be permitted to live. The first born are usually exposed to die; they are not supposed

to be sufficiently "mature," and from the customs attendant on marriage there must always be some doubt of their paternity. Again, if the mother is still suckling a previous child which she has to carry about with her, this fact alone will render it impossible to rear the new-comer. It is said, and the statement is supported by independent evidence, that from one-third to one-half of the newly-born were allowed to perish. The belief that they would be re-incarnated in a subsequent birth helped to reconcile the parents to this painful sacrifice.

The child once admitted into the family may be said to have twice received its life, and is treated with a corresponding excess of affection; so that even the white man, usually so harsh a critic of all wild people, is fain to admit that "in their treatment of children they are superior to more civilised races." The mother suckles her child for two or three years at least; the father takes his turn at nursing, and as the child grows up both parents exert themselves in devising means for its amusement. The childhood of the young Australian is the great time of its life.

Initiation Ceremony.—But sooner or later, in some tribes as early as nine and ten years, this irresponsible existence comes to an end, the girl is transformed by some simple rites into a woman, the boy by a more complex ceremonial into a man. An excellent account of the initiation ceremony, as seen from the outside, in the case of the boys of a tribe near Sydney, was given by Collins[1] so long ago as 1798–1802. He has represented the successive stages of the ceremony in a series of plates, three of which are reproduced here

[1] D. Collins, *An Account of the English Colony in New South Wales; with Remarks on . . . the Native Inhabitants of that Country*, 2 vols. 4to, London, 1798–1802, vol. i.

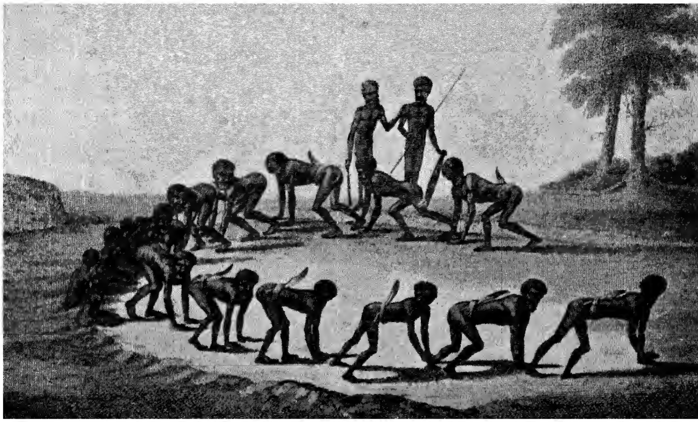

FIG. 147.—Initiation Ceremony. (After Collins, Plate 1.)

on a diminished scale. In the first (Fig. 147) the young men, silent and still, are seen seated at one end of the space which has been cleared of grass for the performance; the older men are parading round on hands and

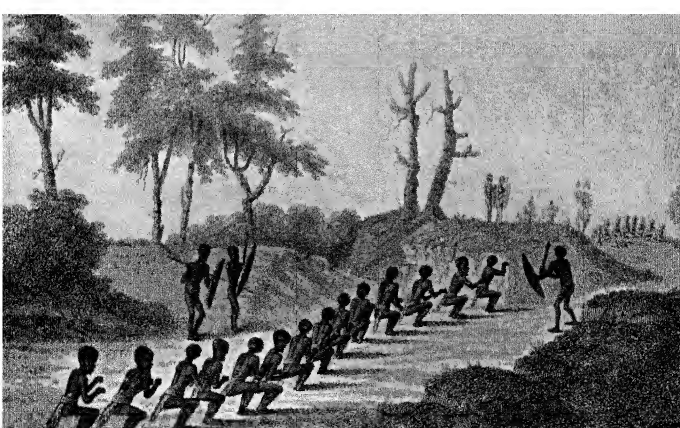

FIG. 148.—Initiation Ceremony. (After Collins, Plate 3.)

feet, and imitating in a very realistic manner the behaviour of the native dog. A wooden sword projecting behind from the girdle does for a tail. Collins says this performance confers the good qualities of the dog and gives power over it, but we may suspect some totemic significance. In the next (Fig. 148) the performers have provided themselves with tails of grass and pretend to be kangaroos,[1] jumping along and stopping every now

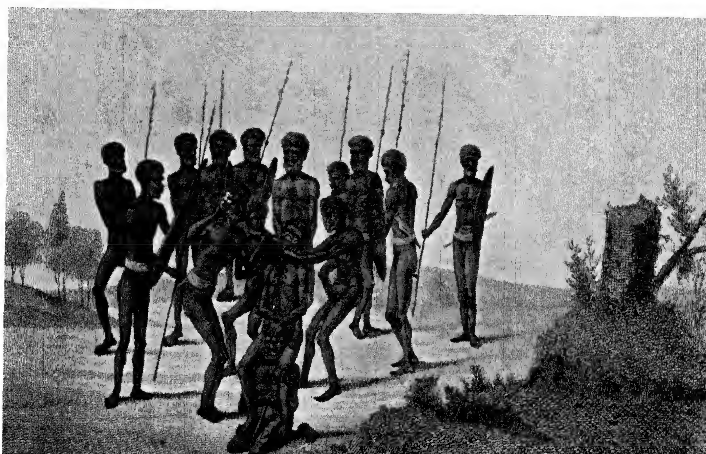

Fig. 149.—Initiation Ceremony. (After Collins, Plate 7.)

and then to scratch themselves; as Collins remarks, there is a good deal of drollery in this dance. In the last stage but one (Fig. 149) the operation of knocking out a tooth (upper incisor) is performed by means of a wooden chisel and a stone; this tries the endurance of the novice to the utmost, some bear it with Stoic fortitude, others yell at the first blow and run away.

The ceremonial differs in important details in different

[1] This performance relates to an incident in the life of one of the sons of the supreme being, Baiame. Howitt, *Journ. Anthr. Inst.*, xxiv, pp. 416, 417, 423; xxv, pp. 299, 301.

tribes, it is simplest among the Kurnai,[1] who commence the performance with a rite "claiming the boys from their mothers"; in the next the novices are put to sleep as boys, to be awakened as men. After this they

FIG. 150.—Bull-roarers of the Kurnai tribe, South-East Australia; 3 is a transverse section of 1. (After Howitt. × ½.)

are made acquainted with the bull-roarer, in itself a mere slab of wood (Fig. 150), at the end of a string, but producing when whirled rapidly in the air weird and piercing sounds, very terrifying to those who, like the

[1] A. W. Howitt, *The Native Tribes of South-East Australia*, p. 616 *et seq.*

women and children, are kept in ignorance of their cause and attribute them to supernatural agency.

But even the initiated, while making the bull-roarer "speak" by his own exertions, still regards its voice as the voice of a god.

The Kurnai, like most of the tribes, use two bull-roarers in this rite, differing in size, the larger (Fig. 150, 1) represents Tundun, the son of the high god, Mungan-ngaua, and the smaller (Fig. 150, 2) the wife of Tundun.

The bull-roarer is not confined to Australia[1]; it is almost universally distributed among primitive peoples; in our own country, this emblem, which represents the very central mystery of the initiation ceremony, survives as a toy.

After the Kurnai have brought the public ceremonial to a close, the initiates have to spend some months secluded in the bush, where, under the tutelage of their spiritual guardians, they are instructed in manly duties and trained in the exercise of self-control.

It must be admitted that our knowledge of the initiation ceremony is very superficial. The aborigines are unwilling to induct the white man into their sacred mysteries, and the presence of uninitiated persons at their observance is strictly forbidden. It is only after establishing some sort of claim to initiation that a few white men, chief among them Howitt, have been admitted as privileged spectators. This obstacle sur-

[1] Andrew Lang cites the Moqui Indians of North America: as a part of their religious ceremonial "in front of a procession of dancers, each holding a live rattlesnake in his mouth, the priest walks whirling a bull-roarer"; "so," he adds, "the ancient Greeks in the mysteries of Dionysos Zagreus whirled their rhombus." For a general account of the bull-roarer see Haddon, *The Study of Man*, London, 1898, p. 277; for a bibliography, Sir J. G. Frazer, *The Golden Bough*, 2nd ed., London, 1900, iii, p. 424.

mounted, there still remain the difficulties of a primitive language, which are never so great as in the communication of abstract ideas.

But even a superficial consideration will show that the ceremony is calculated to produce a profound moral effect. Summoned by messengers sent far and wide, the scattered families of the tribe come marching from all quarters towards the chosen spot, a sacred place, where they assemble in their hundreds. All the preliminary preparations, all these movements for a common purpose, awaken excited expectation. The change from a more or less solitary life to the crowded society of a great concourse acts upon all as another powerful stimulus, and by itself is calculated to bring about a state of mental exaltation.

The central figures, on whom all attention converges, are the novices, who now become the subjects of religious rites, often prolonged over several weeks, which are rendered as impressive as they can be made by dramatic form, rhythmic movement of dance and song, and the exhibition of mystic emblems. Some of the rites are so monotonous and prolonged that they must almost inevitably produce an hypnotic effect, and in some the officiating elders accompany the proceedings with movements of the hands, supposed to be projecting "mana," which call to mind hypnotic passes.

While thus under influences rendering them peculiarly open to suggestion, the novices are instructed in moral and religious teaching, they are admonished against selfishness, told to share all that they have with their friends, to live peaceably, to be strict in their relations towards women, to abstain from forbidden food, to consider the advice of their elders and to obey their voice. For the first time they are told of the existence of a high

god, who can go anywhere and do anything, whose voice is the thunder, which makes the rain to fall and all things to grow up anew, and they are enjoined to please him with the promise that after death he will welcome them to their place in the sky. Such at least is the teaching of the Yuins and some other tribes in the south-east.

That the ceremony does indeed produce a deep and lasting effect is the testimony of those who have been best acquainted with the tribes. We are ignorant of its full meaning, and must refrain from investing it with an imaginary significance, yet it seems in a truly remarkable way to celebrate the transformation of man, the irresponsible animal, into man, the moral being.

When the initiated boy emerges from his retreat in the bush his education is finished and he begins to think of taking a wife.

This is by no means a simple affair, as will be seen in the course of our account of the tribal organisation, to which we now pass.

The tribal organisation can scarcely be considered apart from the terms used to indicate genealogical relationship. They differ a good deal from those used among ourselves, but we shall not enter into details and will only refer to some of the more interesting points.

It is now generally admitted that a son could and did plainly distinguish between his father and all his other relations, just as a white man does, yet in the tribal nomenclature there is no special word for "father," and the same term—"ngaperi" among the Dieri—is applied both to father and father's brother. For his mother's brothers he had a separate name, "kaka," so that he distinguished where we do not, and did not distinguish where we do.

The use of a common term for father and paternal uncle has led some authors to assert that a son called his uncle "father," and thus Sir J. G. Frazer is led to remark that "a Dieri man may have many 'fathers' who never begot him"; this is prettily phrased but it is not exact, as will appear by substituting the undifferentiated term "ngaperi" for "fathers."

This fallacious use of terms has been made use of in emphasising the arguments of those who have imagined that the tribal nomenclature points to a time when individual marriage did not exist, when, in fact, it was supposed that all the "ngaperi" of a boy (*i.e.* father and paternal uncles) were husbands in common of all the "ngandri" women (mother and maternal aunts). This notion of "group marriage," as it is called, is now almost out of date; and how little support it receives from the tribal nomenclature may be shown by the fact that this makes a man the younger brother of his maternal grandmother and at the same time the maternal grandfather of his own wife.[1]

The object of the tribal nomenclature is to determine the tribal status of each individual, particularly with a view to determine how he stands in relation to the women, *i.e.* which of them by the tribal rules he is free to marry. The rules are difficult for all but an expert to apply, but so far as I can make out a Dieri man could not marry his first cousin; some, but not any, of his second cousins he could; he could also marry a woman to whom he stood in the tribal relation of maternal great-uncle, and it often happened that he did.

We may now briefly survey the tribal regulations which governed the individual in his choice of a wife.

By far the simplest case is presented by the Kurnai,

[1] First pointed out by Mr. N. W. Thomas.

the inhabitants of Gippsland, who occupied a tract of country bounded on the south by the sea and on the north by a range of mountains which cut them off from the rest of the continent.

This tribe, which no longer exists, was divided into five clans, and each clan into a number of sub-clans, nineteen in all. Each sub-clan was an aggregate of scattered local groups and the local group was a single family, consisting usually of an old man with his sons, daughters, and grandchildren. Every son inherited a totem from his father, so that although there are said to have been no totem kins, yet there was at least a segregation of totems in the local groups. This tribe was one of those which possessed sexual totems; the emu-wren, which was the elder brother of all the men, and the superb warbler, which was the elder sister of all the women.

The only rule governing the selection of a wife, beyond the prohibited degrees of consanguinity, was that no one could marry within the limits of his own sub-clan; he must choose his wife from outside, and not even thus indifferently from any of the remaining sub-clans, but from one of a small group predetermined by rule. Marriage was thus exogamous; and since the child inherited its totem from its father, the descent was patrilineal or, as it is sometimes called, agnate.

The tribal regulations having been satisfied, the claims of the interested individuals had next to be met, and all over Australia the favourite method was by exchange; if John wants to marry Jane, the affair can be arranged if John has a sister Harriet, and Jane a brother Henry who is willing to marry Harriet, in exchange for his sister Jane. This is the ideal scheme, but failing it there were others, and the most obvious was elopement.

Among the Kurnai, for one reason or another, this adventurous method had become the fashion, and had developed into a regular system, with go-betweens and medicine men, the latter engaged on both sides; by the suitor to ensure success, and by the parents to prevent it. Flight was followed by hot pursuit, and there were often fierce fights, on the issue of which the retention of the bride depended.

Local exogamy with patrilineal descent prevails among several other tribes in the south and south-east of Australia, but associated with totemism in a very interesting way. Among the Narrinyeri each of the clans possessed its own totem, and thus was not merely a local aggregate but a totem kin.

Of all these tribes the East Kulin is in many respects the most remarkable. It is divided into two moieties, speaking different dialects, having different physical characters, and distributed over different areas, one ranging along the coast and the other occupying the interior.

Each moiety is bound together by the possession of a common totem, and is consequently known as a totem class or phratry. The totem of the coast people is the Eagle-hawk; of the interior the Crow.

The fundamental rule governing marriage is that no one can marry within his own phratry; an eagle-hawk must marry a crow, a crow an eagle-hawk. The punishment for offending against this rule was death.

The phratry or "two-class" system, of which the Kulin tribe offers us an example, is widely distributed over the east of Australia; as a rule, however, not, as in the Kulin, with patrilineal, but with matrilineal or cognate descent; *i.e.* the child inherits its totem from its mother.

The effect of this change is revolutionary, for the

social organisation is now brought into complete dependence on the totem and absolved from all connexion with the locality. Thus in the same local group or small tribal subdivision, eagle-hawks and crows will be found living side by side, not always harmoniously. This local admixture of the two classes is the natural result of two factors, (*a*) the wife is generally obtained from an outside local group or tribe, but joins that of her husband, and (*b*) she transmits her totem to her children.

Let us suppose, for instance, that to begin with there were two local clans of a tribe, say MacBees and FitzGees, each with its totem, so that all MacBees were Hawks and all FitzGees were Crows. If, now, a MacBee man brings home a FitzGee bride (crow), then, since her children inherit her totem, we shall have crow totemites born into the MacBee (hawk) clan; and similarly, hawk totemites will be introduced into the FitzGee (crow) clan. Thus patrilocal marriage and matrilineal descent must in course of time effect a complete intermixture of the totems, in whatever way they were originally arranged.

Within each phratry there are numerous subordinate groups, each distinguished by its totem (*totem kins*) and these are distributed in such a manner that the same totem never occurs in both phratries.

The rule for marriage is that a man cannot marry a woman of his own totem, and hence he cannot marry within his own phratry. The totem, as we have said, is inherited from the mother, and thus, if a wallaby of the hawk phratry marries a lace lizard of the crow phratry, the children are lace lizards as well as crows.

The classification into phratries extends beyond the limits of a tribe or even of a number of related tribes

(nation), so that when, say, an eagle-hawk, after wandering for hundreds of miles out of his own hunting grounds, reaches some remote tribe, he may still find himself among eagle-hawks and crows, and, as an eagle-hawk, will be welcomed and hospitably entertained by his brothers in that phratry.

In a large number of tribes the social organisation has suffered a further complication, the members of the tribe being distributed among four classes, each with its subordinate totem kins, or, again, these four classes may be grouped in pairs to form two main classes which correspond to the phratries of the two-class system. Finally, as among the Arunta and related tribes, there are eight classes, arranged in two groups or phratries of four classes each.

What may be the meaning or intention of these complicated classificatory systems is unknown. Some have supposed that they were devised to prevent close intermarriage, but this can hardly be admitted, especially as the two- and four-class systems cannot by themselves have this effect. They would not preclude, for instance, the marriage of first cousins, and yet in some tribes with a two-class system, such as the Dieri, the marriage of first cousins and even of some second cousins is, as we have seen, already provided against by other rules.

Of what use then is the class system? At present we are unable to answer this question. One effect it does seem to have, and that is to restrict freedom of choice in selecting a wife, and this may lead as a direct result to driving a man away from his own tribe to find his wife farther afield, thus broadening the area of selection in compensation for its restriction at home.[1]

[1] Howitt, *Journ. Anthr. Inst.*, 1885, xv, p. 419, calls attention to the connubium existing between the Krauatun, Kurnai, and Coast Murring.

One other effect would seem to follow, that of multiplying the bonds which unite the totemites and knitting them more closely together.

Equally unknown is the origin of the system: unless indeed a hint is afforded by those cases in which the descent is patrilineal. We have seen already how two opposed sections of a tribe, differing in physical appearance, in language, and geographical distribution, form the phratries of the Eastern Kulin. Let us suppose that these phratries were originally two independent and perhaps hostile tribes, one of which had already the crow and the other the eagle-hawk for a totem. If now in the course of their history they should enter into friendly relations, and agree to intermarry, we might then have just such a state of affairs as exists now among the Kulin.

Against this it has been urged that the system of patrilineal descent has in every case been derived from the matrilineal, and is never original. Such a view can scarcely be upheld, however, in the case of the Kulin, for as we have seen matrilineal descent with patrilocal marriage must bring about a complete admixture of eagle-hawks and crows, while in the Kulin they remain completely separate. Patrilineal descent with patrilocal marriage will maintain the original distribution of totems, whatever this may have been; it will maintain a pure separation, though it will not produce it: it will maintain a mixture, but not convert it into separation. Since, however, none of the surrounding tribes present a case of matrilineal descent associated with a pure separation of the totems, we have nowhere to look for the origin of the condition we find among the Kulin, and the only escape of those who uphold the universal priority of matrilineal over patrilineal descent is to

make the further assumption that in their hypothetical primitive state the Kulin were not only matrilineal but also matrilocal.

But this would also lead to the suggestion with which we started of two separate tribes which had entered into a matrimonial alliance.

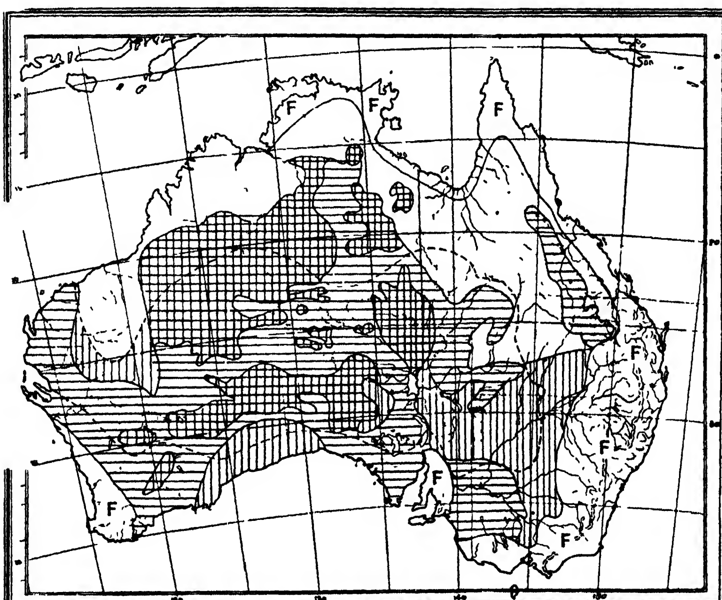

FIG. 151.—The physical characters of Australia. The broken line marks a rainfall of 10 inches; within it the continent receives less than 10 inches of rain annually. The outer fringe left blank but marked F is a forest region; it is defined by a continuous line from the remaining blank area, which is savanna or prairie. The vertical lines mark steppes; the horizontal lines, scrub, or sandy wastes where the only vegetation consists of "mulga," a low acacia and porcupine grass; the crossed lines mark desert areas.

And, as it involves two fundamental changes in the social system, we may still prefer to suppose that the Kulin tribe has retained its patrilineal descent as an inheritance of its original state, a view which is con-

sistent with all that we know of the primitive character of the south-eastern tribes.

The wandering, desert tribes of Central Australia (Fig. 151), especially the Arunta and Loritja,[1] which have yielded such interesting results to the researches of Messrs. Spencer and Gillen and Father Strehlow, are distinguished by many peculiarities, to which, however, we can only give a passing notice, confining ourselves to such ideas or customs as are associated with material symbols capable of preservation. These may help us to explain some of the problematic objects found in Palæolithic deposits.

One of the most important of these emblems is the churinga, a near relation of the bull-roarer. This is a slab of wood or stone carved into shape and incised or painted with a totemic device (Fig. 152). In size it varies considerably, it may be only a few inches or as

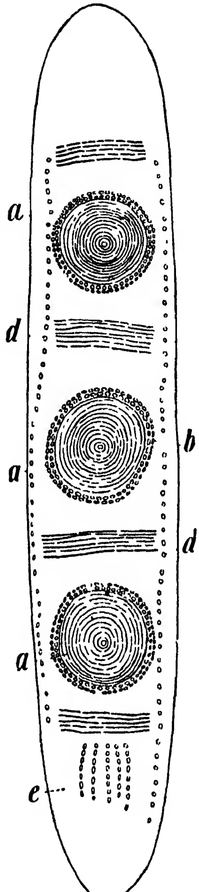

FIG. 152.—Churinga of an Achilpa or wild-cat man. The three series of circles (*a*) represent trees, the surrounding circular spots (*b*) the tracks of men dancing round them, the lines (*d*) sticks which are beaten together to keep time with the dancing; (*e*) are also tracks of men dancing (Central Australia). (After Spencer and Gillen.)

[1] C. Strehlow, "Die Aranda- und Loritja-stämme in Zentral-Australien," 1907, *Veröffentlichungen aus dem Städtischen Völker-Museum, Frankfurt am Main.*

much as five feet in length. Usually the churingas are in pairs, a male and female; the male, which is the larger, being perforated at one end. They are sacred objects which it is unlawful for the women and uninitiated to behold.

Certain wandering totem "gods" are imagined to exist, who are indistinguishable from the natural objects whose name they bear; thus a kangaroo totem "god" and the kangaroo itself are to mortal eyes one and the same thing. The bodies of these "gods" are, however, subject to transformation, and are sometimes changed into a rock or tree, sometimes into a churinga; their spirits remain the same and haunt the place around the rock or tree, but the churingas they carry with them. Should they lose one in their wanderings a tree or rock springs up to mark the place, from which, when a woman passes by, a "ratapa" or spirit child issues and entering the woman causes her to conceive. For this reason women, especially if unmarried, anxiously avoid these sacred spots.

When a child is born it is feigned that the churinga accompanies it into the world, and a close sympathy exists between the two throughout the whole life.

The father "finds" this churinga and has it deposited in the sacred store house, where all the churingas of the local totem group are preserved. It is only taken out for special rites and remains in the house after the death of its possessor.

A churinga house, which is almost always a cave or crevice in the rocks,[1] is attached to each local totem centre. It is strictly "tabu"; no irreverent hand disturbs the growing plants around it, the hunted

[1] Among the Niol-Niol tribe of the Broom district in N.W. Australia, every individual owns a pair of churingas and his own tree in which they are placed.

animal is safe in its vicinity, and it is a haven of refuge even for the criminal condemned to death.

As a consequence of the churinga system the totem is not inherited, it is conferred upon the child by the local deity to whom he owes his birth.

Since the churingas, unlike the bull-roarer, are sometimes made of stone, they are likely to provide us with enduring monuments, and some observers have identified them with the painted stones of the Azilian age. This interpretation would become extremely probable if we could reconcile it with the story of the Tasmanian woman who was seen arranging painted pebbles, each of which she asserted represented an absent member of her tribe (p. 116). The objection previously raised that these could not be churingas because churingas are taboo to the women, may now be met by the discovery that among the Niol-Niol tribe the women as well as the men are provided with these sacred objects.

At the same time it remains extremely unlikely that the churinga of a people so primitive as the Tasmanians is identical in character and meaning with the Australian churinga, any more than either is identical with the Azilian: but all may be regarded as different species of the same genus.

Closely connected with our special study are the productive ceremonies to which we now pass: it is possible they may throw some light on the Palæolithic paintings to be described in the next chapter.

These ceremonies are intended to promote the fruitfulness of the animals and plants on which the natives depend for food, probably by a kind of sympathetic magic.

Each totem group has its own ceremony. That of the Witchetty grub has been very fully described by

Spencer and Gillen, whose account we shall follow. The time announced for the ceremony having arrived, the men of the tribe[1] assemble at the main camp, and those belonging to the Witchetty grub totem steal away to a secret meeting-place not far off, one or two of the older men remaining behind to preside over the sub-

FIG. 153.—Sacred drawings of the Witchetty grub totem on the rocks at the Emily gap, Central Australia. (After Spencer and Gillen.)

sidiary offices performed by the women and those who do not belong to the totem.

The members of the totem, without weapons and divested of all their customary decorations, leave the camp and walk completely nude in single file under the leadership of the headmen of the totem to a special camping ground situated near a rocky gorge, the Emily gap (Fig. 153), where they sleep. They rise at day-

[1] The Witchetty grub people number only 40 all told; they occupy an area of about 100 square miles.

break, but do not breakfast—for the rites must be performed fasting—fall into single file and begin their march; the leader bears with him a wooden bowl, and the men twigs of a Eucalyptus tree, one in each hand. The procession winds along the path originally taken by the legendary totem ancestor, Intwailiuka. It leads to a sacred cave, and in the cave lies a large stone surrounded by pebbles. The large stone represents the Witchetty insect, the pebbles its eggs. The leader now chants an incantation over the stone, invoking the insect to lay eggs, and strikes it gently with his bowl; all the other men do the same, striking it with their twigs. The pebbles having also been struck, the leader then takes one of them in his hand and taps each man over the stomach with it, saying, "You have eaten much food." Finally he butts each man in the abdomen with his forehead.

The performers now descend to the bed of the stream which flows through the gorge, and halt under a rock called "The Decorated Eyes." It was at this spot that Intwailiuka used to throw pebbles (which represented Witchetty eggs) up against the face of the rock; accordingly the totem leader does the same with some churingas which have been taken from the sacred store house and brought for the purpose. While he is thus engaged the men, singing all the time, run up and down the side of the gorge. The churingas roll down to the bed of the stream and are collected to be returned to the store house.

The men again fall into single file and march in silence to the next sacred cave, about a mile and a half away, where the same ceremony as that performed at the first is repeated, and so on to the next and the next, till some ten caves in all have been visited. Then the

journey home begins, and when about a mile from the camp the performers stop to decorate themselves at a spot where the necessary paraphernalia have already been deposited by the old men of the party who were left behind in the main camp. They tie hair-strings round their heads, put on their forehead-bands, inserting beneath them twigs of the Witchetty bush to form a kind of garland, adorn their hair with rats' tails or plumes of cockatoo feathers, and insert their nose-pins. Finally they paint their bodies with red ochre and white clay after the sacred design of the Witchetty grub totem.

They are now ready for a fresh start, fall into line, and waving their Witchetty twigs, approach a long narrow arbour which has been built for their reception during their absence. This represents the chrysalis case from which the imago emerges.

The men of the camp who do not belong to the totem are assembled near by, sitting in silence about a stone's throw from the arbour. Behind them stands one society of the women, painted with red and white lines; the other, painted with white lines bordered by red, is seated among them.

The performers then enter the hut, and as they do so the onlookers throw themselves flat on their faces and so remain till the end of the ceremony is announced. Once inside the arbour the performers begin to sing of the grub in its various stages, of the rock of the Decorated Eyes, and the great Witchetty insect at its base. After this has continued for a fairly long time the leader shuffles out in a squatting posture, followed in the same way by the men, all singing of the emergence of the insect from its case. They then shuffle back again and cease singing. Food is brought them and they break their long fast.

At dusk they leave the arbour, and, avoiding the onlookers, proceed to a spot as much out of sight as possible, where they light a large fire and sit round it singing once more of the Witchetty grub. This continues till just before daybreak, when the singing suddenly ceases, the leader extinguishes the fire, and the non-officiating men and women, who have remained

FIG. 154.—Group of men of the Emu totem, sitting round the totem device painted on the ground (Central Australia). (After Spencer and Gillen.)

prostrate up to this, rise to their feet and run back to the main camp.

The performers remove their decorations, and the leader says, "Our ceremony is at an end; but the others, who are at the men's camp, must have these things (the decorations) or it will not succeed, and some harm will come to us." All respond "Yes! yes! assuredly." The decorations are accordingly distributed,

and just before sunset all the performers obliterate the sacred sign of the totem with which they are painted by rubbing themselves with red ochre; then, assuming their usual decorations, they return to the home camp.

In the ceremony of the emu totem, a totem design is drawn on the ground (Fig. 154). A small plot of ground having been selected, is cleared of stones, made as smooth as possible, and then watered with blood supplied by the performers from their own arms. This acts as a size and renders the surface fit to receive the design, which is painted in with white clay, red and yellow ochre, and powdered charcoal mixed with grease. It represents the emu and its anatomy; two large yellow patches are the fat (a recognised dainty); a large number of circular yellow patches are the eggs in the ovary; a black patch, the egg ready to be laid; two larger concentric circles, an egg which has been laid and incubated; various sinuous lines in red, black, and yellow are the intestines; white spots scattered all about, the feathers; and a thin line of pale pink, enclosing the whole device, is the down. When the ceremony is over the drawing is effaced.

It is extremely fortunate that the study of these and similar ceremonies has not been neglected, till, as in so many other instances, it is too late. Let us suppose an observer to visit these scenes in the remote future, some thousands of years after the Australians have become extinct; what of all the apparatus employed in their elaborate ceremonial might he chance to find? At the most some painted stones. Unassisted, he would be unable to divine their meaning; only the knowledge we have so fortunately acquired could avail.

The existence of a monotheistic belief among people so primitive as the Australians is one of the many

surprises which have awaited the explorer in this field of inquiry. Its profound significance for all speculation on the origin of religion was first recognised by Andrew Lang,[1] whose views were subjected to much lively criticism by E. S. Hartland;[2] the subject has since been discussed by Van Gennep[3] and W. Foy,[4] and more recently by Father Schmidt,[5] whose suggestive theories have pointed the way for further research.

It is difficult, however, to unravel all the perplexities of Australian mythology, owing to the fragmentary state of our knowledge, due in great part to the esoteric character of the cult, which is confined exclusively to the initiated men. To reveal the sacred mysteries is a heinous crime, punishable by death; and it is by no means certain that the few favoured white men whom the natives have admitted to their confidence have always obtained so full a knowledge as they have supposed.

A belief in some kind of high god seems to be universal among the Australians; even the Arunta, once supposed to be as exceptional in this as in so many other matters, are now known to recognise a supreme being, Altjira, eternal and uncreated, whose dwelling place is the sky. He is represented as a gigantic man, red skinned and with long fair hair falling over his shoulders.

[1] Andrew Lang, *Magic and Religion*, 1901, London; *The Making of Religion*, 1898, London; *Custom and Myth*, 1904, London; *The Secret of the Totem*, 1905, London.

[2] E. Sidney Hartland, "The High Gods of Australia," *Folk-Lore* (*Trans. Folk-Lore Soc.*), 1898, ix, pp. 290–329; followed by a reply from Andrew Lang, *op. cit.* x, pp. 1–46, and a rejoinder by E. S. Hartland, x, pp. 46–57.

[3] Arnold van Gennep, *Mythes et Légendes d'Australie*, Paris, 1905, pp. cxvi, and 188.

[4] W. Foy, "Australien 1903–4," *Archiv für Religionswissenschaft*, 1905, viii, pp. 526–549.

[5] Father W. Schmidt, "L'Origine de l'Idée de Dieu," *Anthropos*, 1908, iii, pp. 559–611, 801–836, 1081–1120; and 1909, iv, pp. 207–250.

His feet are like an emu's, and his wives, who are many, have feet like a dog's.[1] All around him are beautiful young men and maidens. He is good, but only rules over heaven, and does not interfere with this world: he did not make man and does not trouble about him.[2] Yet according to one legend he welcomes the spirits of good men to his kingdom.

It is among the Kurnai,[3] whom on other grounds we have regarded as the most archaic of the tribes, that we meet with a monotheistic belief in its simplest and purest form. The supreme being, who is known to them as Mungun-ngaua or "Our Father,"[4] dwells eternal in the sky. Unlike many other primitive gods, he has no wife, nevertheless he has a son, Tundun, who is married, and the Kurnai are his descendants. There is also an evil spirit, Brewin, of subordinate rank.

Once, when a man impiously revealed the sacred mysteries of the initiation ceremony, Mungun-ngaua in his anger sent down his fire, the Aurora Australis, which filled the whole space between earth and sky. Men went mad with fear; and then he caused the sea to rise and overflow, so that nearly all mankind were drowned.

A similar belief in an All-Father and a divine son prevails among many of the Australian tribes, but fused with additional elements, embroidered upon with ancestral or astral myths.

Thus the high god of some of the Eagle-hawk–Crow

[1] This probably has, or had at one time, some totemic significance.

[2] C. Strehlow, "Mythen, Sagen und Marchen des Aranda-stammes in Zentral-Australien," *Veröffentlichungen aus dem städtischen Völker-Museum, Frankfurt am Main.* Frankfort, 1907, vol. i.

[3] A. W. Howitt, *The Native Tribes of South-East Australia*, pp. 490, 492. Howitt was one of the great men or leaders in an initiation ceremony of this tribe.

[4] More precisely translated Father or Father's brother, but in this case the evident meaning is Father.

people (Wurunjerri, Wotjobaluk, and Kulin) is Bunjil, the homologue of Mungun-ngaua, but differing from him by the possession of two wives (black swans), whom, however, he created. He has several sons, but among them one in particular, known under different names by different tribes (as Palyan, the bat, by the Wurunjerri), who is in a special sense his son, having been directly created by him; Palyan thus corresponds with Tundun. The other sons are linked in some way with the totems of the tribe and are identified with certain stars, such as Achernar (α Eridani), as well as others in the constellations Centaurus and Crux.

Bunjil, who is identified with the Eagle-hawk, became desirous of the wives which he had given to his son, and this led to a combat in which the son was wounded in the heel and then turned into a crow. Here we seem to have a reminiscence of some historic event; Palyan is the male sexual totem of the Yuins and related tribes, and his transformation may be connected with the origin of the two classes Eagle-hawk and Crow.

This suggestion is supported by the following myth or legend of the Murray tribes.[1] A long time ago there existed on the earth a number of supernatural beings who created the world and everything else. Some of them had the form of a crow, and some of the eagle-hawk, and the crows were always at war with the eagle-hawks. The crow though wounded in the knee was often victorious. It is to their enmity, and the agreement which terminated it, that the two classes and the marriage rules owe their origin.

Bunjil is also identified with the planet Mars, and the star Altair[2] (al Tair, the great bird), which by a singular

[1] R. Brough Smith, *Aborigines of Victoria*, i, pp. 423–424.
[2] This association of a god with more than one object was not un-

coincidence, if nothing more, is the chief star of the constellation Aquila, the Eagle.[1] One of the natives told Howitt that he well remembered how, when a boy, he was taken out of camp one star-lit night by his uncle, who, pointing to Altair with his spear-thrower said, "Look! That one is Bunjil! You see him, and he sees you!" His two wives, the black swans, are not, however, assigned to the constellation Cygnus, but are definitely identified with two stars, situated one on each side of Altair. Father Schmidt thinks that Bunjil was also the sun, that the dark hemispheres of the moon were his wives, and that the wounding of Palyan in the heel corresponds with the diminishing of the moon on the approach of the pursuing sun.

But among the Australian natives the sun is almost always feminine and the moon masculine.[2] According to Roth,[3] the Cape Bedford tribes regard the moon as the husband of the sun, and they say that there are two suns, who are sisters, the younger is the sun of the hotter, and the elder of the cooler season.[4] Thus it would appear that Bunjil or the Eagle-hawk should be the moon, and this is in accordance with the statement that the bats are children of the moon, for as we have seen Palyan the Bat is the son of Bunjil. The moon also is regarded as the parent of the stars, owing, no doubt, to their only coming out at night.

If Bunjil, the Eagle-hawk, is the moon, what, then, is

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common among ancient peoples; thus Ishtar of the Babylonians was not only the moon, but also the planet Venus and the constellation Virgo.

[1] It seems highly probable that some of the constellations received their names in Palæolithic times. Our Ursa Major is known as the bear among some of the North American Indians.

[2] I know of one exception only: see G. Taplin, in *The Native Tribes of South Australia: The Narrinyeri*, p. 200.

[3] W. E. Roth, "Superstition, Magic and Medicine," *North Queensland Ethnology*, Queensland, 1903, *Bull.*, 5.

[4] The Arunta also give two wives to the moon, but they identify the moon with the opossum. Spencer and Gillen, *Native Tribes.*

the Crow? He cannot be the sun, for the sun represents the wives of Bunjil. We know that he is identified, not as we might have hoped with the constellation Corvus, but with Canopus, which is situated on the opposite side of the heaven to Altair, almost as far away as he can get; but of any association with one of the larger luminaries there seems to be no evidence. It has been suggested by W. Foy that the wounding of the Crow in the heel represents the decline of the sun after the longest day, but as we have seen the sun is already appropriated to Bunjil's wives.

Thus, though some astral myth seems to be involved in the history of Bunjil, it is impossible as yet to give a consistent account of it.

FIG. 155.—Earth figure, in relief, of the chief spirit, known here under the name of Daramulun (South-East Australia). (After Howitt.)

Daramulun, who is the supreme being of the Yuins and the allied tribes Theddora and Ngarigo—the good spirit who can go anywhere and do anything—offers one of the most difficult of the many difficult problems of Australian mythology. He is identified with the Eagle-hawk and thus we may suppose with the moon;[1] his image (Fig. 155), nearly the size of a man, is carved in relief on the ground and a dance performed round it as a part of the initiation ceremony. The head bears two horns,[2] perhaps to symbolise the "horned moon." If Daramulun is the moon he should be homologous with Bunjil or Mungun-ngaua.

But, on the other hand, he is said to have had two

[1] The sun according to Father Schmidt.
[2] Ishtar was represented by the Babylonians as a horned goddess.

mothers[1] and thus becomes a son. His mothers[2] were Emus, and as the Emu is connected with the sun—the young sun is hatched from an emu's egg—these may be the sister wives we have already met with in the Bunjil myth. Their husband, Daramulun's father, should therefore be the moon and Eagle-hawk, *i.e.* Daramulun himself!

That Daramulun is really a son and tribal ancestor is indicated by the fact that, like Tundun of the Kurnai, he is represented in the initiation ceremonies by the bull-roarer. He at first lived on earth and taught the Yuins all they knew; then he died and his spirit ascended to heaven. This is the only instance in the Australian mythologies of a god who suffered death. His name was not quite so secret as we might suppose, for it was known to an old woman who was questioned on the matter by Howitt.

It is tempting to regard this god as a deified ancestral hero. As an answer to Andrew Lang's objection that the aborigines never speak of a man after death, and thus are very unlikely to deify him, it may be recalled that Daramulun never is spoken of except by the initiated during the initiation ceremony.

The Daramulun myth may be a mere torso, which has been deprived of the All-Father, or it may be a rudiment which has not yet acquired one.

Among the Kamilaroi and other tribes of the four-class system—Eagle-hawk, Crow, Emu, and Red Kangaroo—the All-Father is Baiame. Like Bunjil he has two wives, but they seem to be Emus; and here, curiously enough, we meet again with Daramulun, who has become the son and brother of Baiame, though he still remains the Eagle-hawk and retains his character as

[1] One of them no doubt an aunt!
[2] According to Howitt, who, however, originally gave them as wives.

tribal ancestor. Like Palyan he is lame, having lost or injured one leg as the result of an accident while chasing the Emu, the bird sacred to Baiame.[1]

The Baiame myth evidently corresponds rather closely with that of Bunjil, in so far as the various personages are similarly related to each other and are assigned the same functions; but they are not strictly homologous, for the divine son or tribal ancestor in the one is Palyan, the Bat, who has become the Crow, while in the other he is Daramulun, the Eagle-hawk, and thus of the same nature as Bunjil, if not identical with him.

There seems some reason to suppose, as Father Schmidt maintains, that the Baiame myth points to a conflict between an Eagle-hawk-Crow people on the one hand and an Emu-Kangaroo people on the other, in which the latter were victorious, and to a peace which was crowned by a matrimonial alliance.

Purified of its ancestral and astral accretions the conception of Baiame impresses us by its noble and exalted character. Like all the Australian high gods he is absolutely supreme, permitting no equal, but more distinctly than most, he alone is creator and preserver, benevolent and ever ready to help; if anthropomorphic, he is never animal, and though remote he is always accessible through mediating spirits.

We must pass over, although they are not without interest, the gods of the remaining Australian tribes.

On the origin of the gods[2] it would be unsafe to

[1] It has been suggested that the Yuins did not recognise this defect in their Daramulun, the more especially as they give two good legs to the image by which they represent him. This, however, is difficult to reconcile with the fact that his very name, according to W. Ridley, means "leg of one side." It really seems as though the Daramulun myth of the Yuins may be only a mutilated fragment of that of Baiame. The existence of Daramulun's mothers suggests a father, who may have been forgotten, or may simply have been unknown to Howitt.

[2] For a full and suggestive treatment of this subject reference may be made to the work of Father Schmidt already cited.

dogmatise. It is tempting to suppose that a Mungun-ngaua was the common ancestor from which they have all been derived, but this is by no means certain. Some may have arisen independently, perhaps by the deification of a great man or hero.

Death and Burial.—No aborigine supposes that death by disease is a natural event; it is due to evil magic, and must if possible be avenged. One death involves another, too often of innocent men.

The modes of disposal of the dead are extraordinarily various; almost every tribe has its own customs, and their enumeration would be an epitome of almost all the mortuary customs in the world.[1]

In some rare cases the dead are not disposed of; the dying person is placed comfortably before the fire, and then both he and the camp are abandoned.

Occasionally the body is given a cannibal burial, being eaten, all but the bones; and not uncommonly parts of it are eaten as a funeral rite.

Sometimes the body is burned on a funeral pyre; the ashes are collected and carried about in a skin bag; sometimes it is placed on a platform of boughs built up in a tree (Fig. 156), and left there till the flesh has disappeared; the bones are then buried, with the exception of those which are preserved for use as charms; or, again, the corpse, after being placed on the platform as before, is dried in the smoke of a greenwood fire, and thus converted into a kind of mummy.

But more usually the dead are buried in a carefully prepared grave, yet even in this case there is a differ-

[1] "The Greeks burn their dead, the Persians bury them; the Indian glazes the body, the Scythian eats it, the Egyptian embalms it. In Egypt, indeed, the corpse, duly dried, is actually placed at table—I have seen it done."—Lucian, Περὶ Πένθους, in *The Works of Lucian of Samosata*, translated by H. W. and F. G. Fowler, Oxford, 1905, iii, p. 217.

ence, for some tribes lay the body out in an extended attitude, while others cord it together with the knees drawn up to the chin and the arms crossed over the breast.[1] The body is often definitely orientated in a direction determined by the class and totem. In some cases the burial place was at the end of a gallery

1.

2.

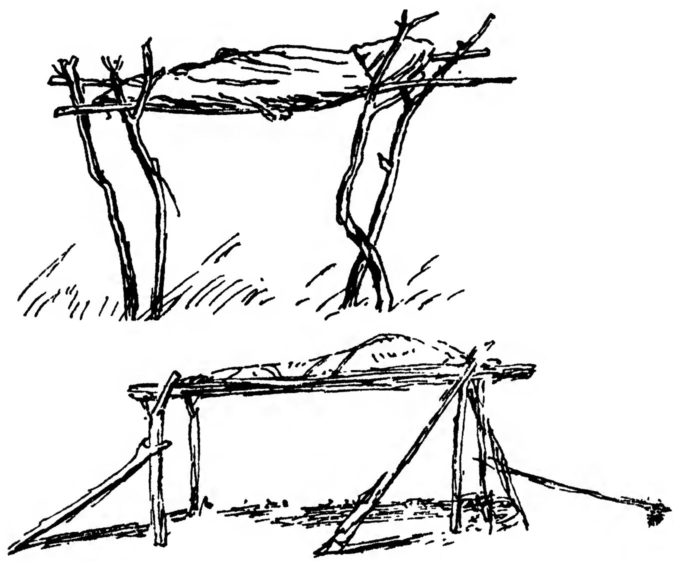

FIG. 156.—Platform Burial (1) in Australia, (2) in North America (Sioux).

excavated from the bottom of a shaft, the mouth of which was covered with a mound.

The deceased is sometimes buried in full dress—head-band, nose-peg, waist-band, and kilt—and swathed in a wallaby rug. Very commonly his spears and other weapons are placed in the grave with him, and in some

[1] This is the contracted burial which was so prevalent in Europe in Neolithic times. When the body dries up in this state we have a mummy like those of South America. Dr. Testut thinks that the Magdalenian man of Chancelade (see p. 589) was buried in the contracted posture.

cases scrupulous care is taken not to omit a single scrap of his property. If, however, the deceased was a man of violent disposition during his life it is thought just as well not to provide his spirit with weapons, and he is left to enter the next world without them. Everything is done to make the last resting place as comfortable as possible; at the bottom of the grave a bed of ferns is laid, food is placed by the body, a drinking cup is provided, and when the earth has been filled in a layer of heavy stones is placed on the top; sometimes a head stone is raised or a semi-circular mould of earth. A fire is lighted at one end, or on each side, and may be kept burning for a month.

As a rule the grave is dug near the camp, but we find an exception even to this, for in the Gringai country there is a recognised burial-ground, and the dead are carried several miles that they may rest in that favoured spot.

Recurring for a moment to the practice of platform burial, it may be pointed out that this is included among the many methods employed by the North American Indians in disposing of their dead. It is remarkable to find the same singular custom carried out in the same manner among races so widely separated in space as the Australians and the Red Skins. An ancient common origin seems to furnish the most natural explanation. Prof. Klaatsch [1] has seriously suggested that tree burial is a reminiscence of the time when man had not yet completely emerged from the Simian stage and made his nest in trees like the Orang!

The beliefs of the Australians concerning the nature of this world and the next, though primitive, are less so than we might expect. The earth is conceived as flat,

[1] H. Klaatsch, *Zeits. f. Ethn.*, 1907, xxxix, p. 660

bounded by the sea [1] and surmounted by the sky, which is supposed to be a solid vault, inhabited by spirits of the dead and supernatural beings, all under the rule of the supreme god.

But spirits are not confined to sky-land, they also people the earth, all kinds, good and bad, in great numbers. The spirit of a man not only survives his death, but exists before his birth; indeed, birth is not connected with sexual intercourse, but is referred to the inhabitation of a spirit.[2] The spirit leaves the body in dreams and may be seen by exceptional persons such as medicine-men.

The creation of man is the subject of several myths. The Dieri [3] have a story of how the Mura-mura [4] first made some little black lizards like those that may still be found under the bark of trees. Being pleased with them he decided to convert them into men. He separated the digits of their feet and so produced fingers and toes; he improved their features and then set one of them up on its hind legs, but its tail being in the way it tumbled over, so he cut off its tail, and it walked away upright. It may be noted in passing that the primitive inventor of the story shows a truer sense for homologies than Dante,[5] who has described a similar transformation; but the great poet not knowing what to do with the tail, splits it lengthwise to make the human legs and then disposes of the hind legs of the lizard in a grotesque manner: "poscia li piè di retro,

[1] Bunjil oceanum creavit mincteone plures per dies in terrarum orbem. Bullarto Bulgo magnam totii copiam indicat.—R. B. Smith.

[2] Although this is asserted by the best observers, I cannot help thinking that the ideas of the natives on this subject are more complex than is supposed.

[3] R. Brough Smith, *op. cit.* i, p. 425.

[4] The Mura-mura are mythical beings like the Alcheringa of the Arunta, or say, according to Andrew Lang, the Greek Titans!

[5] *Inferno*, Canto xxv, 83–135.

insieme attorti, diventaron lo membro che l'uom cela." The Australians had, however, the advantage of living in a country where some lizards do assume the erect attitude for a short time.

Bunjil [1] is said to have made man out of clay. He began by modelling two human forms. He looked upon his work, and was satisfied with it. Then he danced round it.

Next he took the fibres of a eucalyptus tree and made it into hair. To the one form he gave straight and to the other curly hair.[2]

He again looked upon his work, was satisfied with it, and again he danced round it.

He next polished them all over with his hands; lay down over each and breathed into them the breath of life.

For a third time he danced round them.

Then he made them speak and they rose up adult men.

In Queensland [3] the moon (who may be connected with Bunjil ?) is the creator of the first man and woman, and among the Unmatjera [4] the crow plays the part of collaborator if not of actual creator.

Among the many myths which refer to the next world there is one of especial interest which prevails among the Arunta. We have seen that Mousterian man looked to an existence beyond the tomb, but the Arunta myth shows the danger of concluding from this that he regarded the soul as immortal. It runs much as follows :—

[1] R. Brough Smith, *op. cit.* i, p. 424.

[2] It is interesting to observe how often contrasted bodily characters are referred to in the legends, sometimes light and dark skin, sometimes swift and sluggish blood.

[3] W. E. Roth, *op. cit.* p. 15.

[4] Spencer and Gillen, *Northern Tribes*, p. 399.

In the far North surrounded by the sea, lies a long narrow island, it is the island of the dead ![1] There grows the white eucalyptus (tree of death) and the kaluta with its bell-shaped capsules. The branches of the trees curve downwards till they reach the ground and so form dome-like arbours. Various kinds of white animals, bandicoots, lizards, and snakes run along the ground, white cockatoos and other birds perch in the trees, pelicans and ducks swim in the water, and white avocets wade along the strand. The spirits of the dead, white, airy forms, feed on the animals and fruits, which they eat uncooked. At night they dance; by day they sleep.

When a man dies his spirit stays near the grave till the last funeral rite is over, then he finds his way to the island of the dead and stays there till the first rainfall, when he wanders back to his home, visits his relatives and warns them. "Take care or you may become as I." If he has a son he goes behind him, grips him by the shoulder, and enters his body, whereby his growth is increased. Then he returns to the island and after some adventures lives there as before, till the time again arrives for him to make another visit to his home. His relatives invite him to eat with them; horrified, he

[1] It is very interesting to meet with such a legend among these remote people. The Egyptians and Babylonians had an island of the dead which Hommel identifies with Socotra (F. Hommel, *Die Inseln der Seligen in Mythus und Sage der Vorzeit*, 1901, Munich). Van Gennep remarks that the Euahlayi have also an island of the dead and adds that the belief is widely distributed, especially among the Celts.

Hesiod's island of the dead is well known; his account of it may be rendered almost literally as follows:

> "Far from the Immortals and the rule of Kronos,
> By deep Okeanos, in the islands of the blest
> They dwell, they of untroubled soul.
> Happy heroes! For them the teeming earth
> Brings forth thrice yearly honeyed fruit."
>
> *Works and Days*, 169–173.

flees back to the island of the dead. Soon after his return a great black cloud arises in the west and covers the face of the sky. It begins to thunder, he rushes to a tree and runs round and round it till it is struck by lightning; he raises his hand as if to ward off a blow, there comes a blinding flash and both tree and spirit are reduced to ashes. Here then is a definite end; so that according to this curious belief the soul may survive the body and yet not be immortal.

The Arunta have, however, another legend according to which the souls of good men go up to Altjira in heaven and live there for ever, while the souls of bad men go down to the underworld, the dwelling place of the poison-gland demons,[1] by whom they are consumed.

A belief in future rewards and punishments was indeed widely spread.

It prevailed among the Narrinyeri.[2] In this tribe accused persons were tried before a kind of jury, consisting of elderly men and presided over by the chief. It was called the tendi; and Taplin [3] tells us of an old man, much beloved, lying at the point of death, surrounded by his friends, who as death approached pointed upwards and murmured, "My tendi is up there."

Poetry and Prose.—Very little of what might be called the unwritten literature of the Australians is of a kind to appeal to us. Its symbolism belongs to a different world of thought and is as yet but imperfectly understood. Besides this, in the white man's rendering

[1] One is tempted to ask whether these poison-gland men of the Arunta bear any relation to the poison-gland men of Babylonia.

[2] In this tribe there was a kind of grace before meat. When a wallaby was about to be cooked, the men standing round struck up a sort of chant, stamping with their feet, and directly the wallaby was put on the fire, they rushed towards it, and lifting their spears towards the sky, shouted in chorus. This ceremony they say was instituted by their god, Nurundere.

[3] Taplin, *The Narrinyeri*, 1879.

it has lost for the greater part both its spirit and its form.

A sprightly marching song begins :—

> "The Narrinyeri are coming, Oh ! Oh !
> Soon they will appear, Oh ! Oh !
> Carrying kangaroos,
> Quickly they are marching, Oh ! Oh !"
> etc., etc.

As an instance of genuine poetic feeling we have the following [1] :—

> "We go all !
> The bones of all
> Are shining white
> In this Dulur land !
> The rushing noise
> Of Bunjil our Father
> Sings in my breast,
> This breast of mine !"

The following story [2] affords us a glimpse of the manner in which the natives regarded Baiame :—

Then Baiame departed from the earth. He went away to live in Bullimah, the land of rest afar off, far beyond the mountains of Oobi-Oobi. Then all the flowers of the plains and all the flowers of the hills and all the flowers of the woods withered and died. Not a flower opened in its place. The earth was desolate and bare.

With the flowers went away the bees. In vain the women went out with their wirries to collect the honey. Always when they returned the wirries were empty. There remained in all the land only three trees where the bees still lived and worked. These no one dared to

[1] A. W. Howitt, *Journ. Anthr. Inst.*, xvi, p. 330, given by Andrew Lang as "done out of the literal version with the native words," *Folk-Lore*, x, 1899, p. 35.

[2] K. Langlow-Parker, *More Australian Legendary Tales*, London, 1898, p. 84.

touch, for Baiame had set his mark on them, making them his for ever.

The children cried for the honey, and the women murmured against the medicine-men who forbade them to touch the sacred trees of Baiame.

When the all-seeing spirit (the mediator) saw that although they hungered for honey, no one touched the trees of Baiame, he informed Baiame of their obedience.

Baiame heard of it and was pleased. He said he would send them something that the children would find as sweet as honey, and soon indeed sugary flakes fell on the bilbil trees, and liquid manna, like honey, which ran along the branches. It fell all around on the ground: the children gathered it and ate of it and were happy.

But the medicine-men longed to see the earth covered again with flowers, as it was before the departure of Baiame, so that they resolved to go to Baiame and beg him to render the earth beautiful as before.

They set out secretly and after walking many days towards the north-east they reached the foot of the great Oobi-Oobi mountains, whose peaks pierce the clouds. But the sides of the mountains were too steep to be climbed, so they wandered round the base till at last they saw a pathway cut in the solid rock, and above it another, and then another, and again others rising so high that they were lost to sight.

They began to ascend, but after climbing all day they seemed as far off from the top as ever, for the pathway was winding, and so at the end of the second and the third day; but on the fourth day they reached the summit.

Then they saw some circles of piled-up stones and on entering one of these they heard the boom—boom

of the bull-roarer, announcing the presence of the spirit-messenger of Baiame. He asked them what they sought in this sacred place and they told him how sad the earth was since the departure of Baiame and how all the flowers were dead. Baiame had indeed sent them manna in place of the honey, but what they regretted was the flowers, the flowers which had once made the earth so gay.

Then the spirit-messenger told the serving-spirits to take the medicine-men to Bullimah, where they might gather as many flowers as they could hold in their hands.

So they were carried through a hole in the sky to the beautiful land of Bullimah where flowers bloomed on every hand, so numerous that they looked like hundreds of rainbows lying in the grass.

The medicine-men were deeply moved and at first could only weep for joy.

Then they stooped down and quickly gathered flowers of every kind. . . .

Here we may break off; the rest of the story is of even greater interest, since it enables us to perceive how the myth was invented to explain the wonderful renewal of life which attends the coming of the rain in a thirsty land. It is given in full by Mrs. Langlow-Parker.

The aborigines are not always pathetic, they have a sense of humour, on about the same level as some German students who call the policeman an octopus; the aborigines call him a starfish, which conveys the same idea, and shows at the same time that they are close observers of the habits of sea-animals even when these are not good to eat.

Language.—We cannot speak of an Australian, any

more than of a European language. There are many languages in Australia, differing widely from one another both in structure and vocabulary. All are primitive, eminently plastic, with the promise of a healthy growth for which the opportunity has now passed away. They are all agglutinative, the grammatical relations being indicated as a rule by suffixes. They present a complicated apparatus of parts of speech, nouns, pronouns, verbs, adjectives, adverbs and prepositions; there are three numbers, a dual as well as a plural; but no genders. As we might expect, their vocabulary is remarkably deficient in abstract and general terms; thus though every useful tree has its name, there is no word for tree in general; so with fish, there is a name for each kind that is good to eat, but for fish in general, only a phrase, such as "food-in-water."

The investigations of the distinguished philologist, Father Schmidt,[1] have thrown a flood of light on the nature and the distribution of the Australian languages. The broadest distinction may be made between those of the north—which among other differentia possess an *s* sound—and those of the south, which are without it. The boundary between these groups is shown on the map (Fig. 157).

The northern languages fall into two great groups, and a third which seems to be intermediate with them.

One of these groups, distinguished by vowel endings to its words, resembles, more closely than the others, the Papuan languages of the opposite coast of New Guinea and is therefore regarded as the latest comer.

The languages of the south are united by many characters in common, but those spoken by tribes with

[1] Pater W. Schmidt, "Die Gliederung der Australischen Sprachen," *Anthropos*, 1912, vii, pp. 230, 463; 1913, viii, p. 526.

FIG. 157.—Map to show the distribution of the more important tribes, the languages and class systems of the Australian aborigines. The thick line making an open locp in the middle divides the northern from the southern group of languages; its two closed loops and the area marked B enclose Bunjil-speaking tribes.

The different languages are distinguished by a difference in type, thus in the south the oldest languages are indicated by the black-letter used for the Kurnai: in the north by the church text on the north-west, the next oldest by the italic used for the Arunta, and the most recent by the modern type used for the Roper-river tribes.

The different class systems are indicated by male or female symbols according as descent is patrilineal or matrilineal; the two-class systems are represented by a circle,[1] the four-class by a square, and the eight class by an octagon.

The two phratries are indicated as follows :—

Bunjil-Waang .	♂	Gwaigulleah-Gwaimudthen	♀
Kararu-Matteri .	♀	Wutaru-Malera . .	♀
Kilpara-Mukwara	♀ ♀	Wutaru-Pakuta . .	♀
Walar-Murla . .	♀	Wutaru-Yunguru .	♀
Ngielpuru-Mukulo	♀ ♀	[2] Illitji-Liaritji	♂
Malian-Umbe .	♀	Uluuru-Kingilli	♂
Kupatin-Dilbi .	♀		

The four classes are indicated by numbers thus :—

1. Ipai-Kumbo-Murri-Kubbi
2. Terwain-Baring-Bunda-Balkoin.
3. Kupuru-Wungo-Kurgilla-Bunburi.
4. Patingo-Kungilungo-Marinungo-Tumbeungo.
5. Korpal-Kuial-Karibura-Muna.
6. Kari-Waui-Wiltu-Wilhtuthu.
7. Wande-Walar-Jorro.
8. Panunga-Bulthara-Purula-Kumara.
9. Banaka-Barung-Palyeri-Karimera.

For the class names of the eight class systems see Spencer and Gillen, *Northern Tribes*, p. 100 *et seq.*

[1] A blank circle is used for tribes without any class system, such as the East Mining, Narrinyeri, Kurnai, and Turubul, except in the case of the Buandik who have Kroki-Kumite, and the Tatathi and Bangerang, concerning whom our knowledge is deficient.

A blank square is used for tribes in which phratry names do not exist or are unknown.

[2] The same symbol has been used for the last two phratry pairs.

patrilineal descent and no class system differ markedly from the rest. Thus among the Kurnai and Narrinyeri words are common which begin with *l* and *r*, while over all the rest of the continent it is an almost universal rule that no words begin with these letters; and again, while words generally end in vowels elsewhere—especially among tribes with the two-class system and matrilineal descent—among the Kurnai and Narrinyeri, on the other hand, they often end in explosive or even double consonants.

Besides differences depending on the sounds with which a word begins and ends, there are others of great importance, in particular the position assumed by a noun when it is used as a genitive; thus, if it is placed after the noun it qualifies, the language is a prefix language; if it is placed before, a suffix language. In French, for instance, a prefix language, we say "timbre-poste"; in German, a suffix language, "Post-marke."

This difference governs the whole spirit of a language. All the Australian are suffix languages, but some, notably the Kurnai and Narrinyeri, show that they were not always so, for they still place affixless genitives after the noun.

In most of the characters by which the Kurnai and languages allied to it differ from those of the rest of Australia, they approach the Tasmanian, which differs from the Kurnai chiefly by opening its words with vowels. We are thus led to regard the Kurnai and the Narrinyeri as among the very oldest languages of Australia; a conclusion which is in harmony with the primitive character we have already been led to assign to one of these tribes.

Many of the Australian tribes could talk not only by speech, but by gesture. By an elaborate system of

conventional signs they could carry on a simple conversation at a distance; a great convenience when there was any doubt whether an approaching party was of

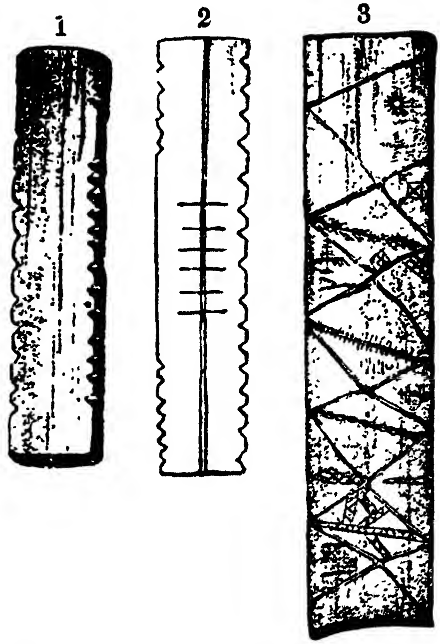

FIG. 158.—Message-sticks. 1. To accompany an invitation to a dance (corroboree). The notches stand for the people who are invited to be present; the four at the upper right-hand corner indicate four old men, those lower down the women, and those on the left hand side the younger men who are to accompany them. 2. The notches along the sides represent the items of the message, the transverse lines in the middle the number of days the messenger has travelled. This stick is painted blue at one end and red at the other. 3. Message-stick sent by a chief. The design it bears is traditional and well known among the tribes. The women are not allowed to look upon this stick; and its summons must be instantly obeyed.

hostile or friendly intention. The Kurnai were without this gesture language and this may be another instance of their primitive character.

A method of signalling by means of ingeniously

produced columns of smoke was also very generally practised.

Although the Australians have not developed a system of writing, yet they make use of signs marked on their message sticks (Fig. 158). These sticks are carried by messengers—who enjoyed many of the privileges of our mediæval heralds—to identify them in their office, and the signs upon them serve as a rude kind of *memoria technica* to insure the accuracy of the message.

Counting.—The misconceptions which prevail on this subject are due to the fact that as a rule there are no separate words for numbers beyond three, but counting does not cease with this number; thus among the Dieri for instance, 4 was expressed by 2 + 2; 5 by 2 + 2 + 1 or one hand; 6 by 2 + 2 + 2 and so on up to 10, which was indicated by both hands, and 20 by both hands and both feet, or one man. Dawson says the tribes of Victoria could count up to 100 and gives expressions for numbers up to 90, which was "four men two hands," and thus similar to the French "quatre-vingt-dix."

We may suppose that the first peopling of Australia [1] took place at a time when it was possible for Palæolithic man, with such primitive floats as he possessed, to enter the continent from the outlying islands of the East Indies, by way of Torres Straits, which then opposed a far less formidable barrier than now. As the immigrants slowly dribbled in they followed the game in all directions, multiplied freely, and spread over the continent till they at length reached its south-eastern corner,

[1] For the successive cultures of Australia, see F. Graebner, "Die Melanesische Bogenkultur u. ihre Verwandten," *Anthropos*, 1909, iv, p. 726 *et seq.*, p. 998 *et seq.* Pater W. Schmidt, "Die sozialogische u. religiös-ethnische Gruppierung d. Australischen Stämme," *Zeit. f. Ethn.*, 1909, xli, p. 328 *et seq.* F. Graebner, "Zur Australischen Religions-Geschichte," *Globus*, 1909, xcvi, pp. 341, 362, 373.

whence they made their way to Tasmania and similarly occupied that country. Somewhere about the time that occupation commenced, more probably before than after, the migrating stream entering Australia may be supposed to have undergone some change, so that it no longer consisted of Ulotrichous, but of Lissotrichous people. These almost everywhere—except in Tasmania—displaced the older inhabitants. In what precise manner it is difficult to say. Possibly to some extent by extirpation, for though tribal wars have never been waged on a great scale since our knowledge of the country, yet it is by no means impossible that fighting was fierce and general when the different races first came in contact. Possibly also by absorption; this indeed seems extremely likely. The most serious objection is the fact that among the existing Australian aborigines not a single instance of woolly hair has yet been recorded, and that on the whole these people present a remarkable uniformity of bodily type.

Yet differences exist and, from the early voyagers onwards, have repeatedly attracted the attention of observers [1]; curliness of the hair is one of them, it has been observed in numerous districts and particularly in the region of the Darling and the Murray.[2]

Though it might be supposed that the facts are common knowledge, yet after consulting several anthropologists I have been unable to ascertain how the character of the hair is affected in the offspring when Ulotrichous and Lissotrichous people are repeatedly crossed. Sheffelt [3] records some important results, but

[1] P. Topinard, "Sur la Race indigène de l'Australie," *Bull. de la Science d'Anthropologie*, Paris, 1872, pp. 211 *et seq.*

[2] The hair is never woolly, and the term "crépu" applied to it by some French writers is too strong.

[3] E. Sheffelt, "Rassen-anatomische Bemerkungen ü. d. Dicke d. menschlichen Haare," *Korrespondez-Blatt, Deutsch. Ges. Anthr.*, 1912, xliii, p. 43.

they are for one generation only; he gives two cases of a cross between a white man and a negress, in both the hair was but slightly wavy; one between a negro and a North American Indian woman, in this it was wavy; and one between a Dahomey negro and a Bengalese woman, and in this it was very wavy. What we really want to know is whether a small admixture of Ulotrichous blood in a Lissotrichous people would in the long run give rise to wavy hair, free from any cases of woolliness, but on this point we have no information.

Apart from the hair, rather strong evidence exists of the survival of Tasmanian characters. Anthropologists have long recognised the presence of a rather inferior people over an ill-defined region in the south and particularly in the south-east of Australia. They are distinguished in particular by the comparatively low altitude of the cranial vault, flat-headedness or "platycephaly."

This it may be recalled is one of the most obvious peculiarities of the Neandertal skull.

Numerous observers[1] have given us important data on the platycephaly of the Australians; using these together with some supplied to me by my colleague, Prof. A. Thomson, and my own observations on the skulls in our University Museum, I find, that counting only those examples in which the height is less than the breadth, that of platycephalic skulls there are in:—

(Papua, 26 %)	North Australia, 10 %
North-West Australia, 14 %	Queensland, 3 %
New South Wales, 26 %	West Australia, 27 %
Victoria, 40 %	South Australia, 65 %

(Tasmania, 75 %).

[1] Sir W. Turner, "Voyage of the Challenger," *Reports*, 1884, x, p. 40 *et seq.*, in particular, 47. A. W. D. Robertson, "Craniological Observations, etc.," *Proc. Roy. Soc. Edin.*, 1912, xxxi, pp. 1–17. H. Basedow, "Der Tasmanier-schädel, ein Insulartypus," *Zeits. f. Ethn.*, 1910, pp. 175–227.

It will be seen how this character steadily increases as we proceed southwards, approaching at length the value found for Tasmania. The closest approach to the Tasmanian is not found, however, in Victoria, where we might have expected it, but in South Australia, though it is possible that this result depends on insufficiency of data. Another primitive feature common in the south (Victoria and Tasmania) but absent from Queensland is the frontal torus.[1] Thus the evidence afforded by the bodily structure—the best in these matters—distinctly indicates the survival of primitive characters in the south of Australia, *i.e.* where *ex hypothesi* we might have expected to find them.

Whatever other evidence exists points in the same direction; the language of the Kurnai and Narrinyeri finds its nearest ally in Tasmania; their material culture is poorer in many respects than that of the more northern tribes, and their social organisation is simpler.

The origin of the Lissotrichous people who supplanted the Tasmanians in Australia is a question open to discussion, but it seems most likely that they had branched off from the same stem as the white races of Europe and Asia, though from a point near its base, and that they subsequently suffered an arrest of development. The sporadic occurrence of individuals with Australoid characters in the Pacific, and the existence of related races such as the Veddahs and Ainos in areas so widely separated as India and Japan, is highly suggestive and may indicate the extension of the same or a similar race over a great part of the old world.

There is much which might lead us to suppose that the aborigines entered Australia in very remote times,

[1] Sir W. Turner has pointed out that there is a marked contrast between the elongated curved clavicles of the natives of the Riverina and the short, thickened clavicles of those of Perth.

in the early days of the Monastirian or perhaps even in the Tyrrhenian age, but direct evidence on this point was wanting until the year 1914, when the British Association was hospitably entertained by our fellow-citizens in Australia, who had reserved for us as a particular surprise a fossil human skull which, though found in 1884, had only recently been brought to Sydney for scientific investigation. It had lain embedded in red clay at a depth of about seven feet below the surface of the ground in sediments of Pleistocene age, which contain, though not in this precise locality, the bones of extinct Marsupials, such as Diprotodon, Notelephas, and Nototherium.[1] It was exposed to view after heavy rains in a gully of the Darling Downs, Queensland.

On our arrival in Sydney one of the first kind acts of my friend Sir Edgeworth David was to place this skull in my hands, and as I gazed upon its face great was my delight to recognise an old acquaintance. It was evidently the skull of an Australian aborigine, and, as we now have good reason to believe, of Pleistocene age. It has since been studied and described in detail by Mr. S. A. Smith,[2] who finds that while the brain-case is in every particular that of the Australian native, the face, on the other hand, presents some divergent characters by which it approaches the apes. It is unusually prognathous, the palate is larger and longer than in any existing man, the cheek teeth, which are of great size, are arranged in parallel straight rows (Fig. 159, 2), and the projecting canines, which for a human skull are prodigious, bear facets (Fig. 159, 4)

[1] The skull is mineralised in the same manner as the bones of the extinct marsupials, and on being cut open was found to contain material like the red clay.

[2] S. A. Smith, "The Fossil Human Skull found at Talgai, Queensland," *Phil. Trans.*, Ser. B, vol. 208, 1918, p. 351.

worn by use, which show that these teeth worked against the canines and the first premolar of the lower

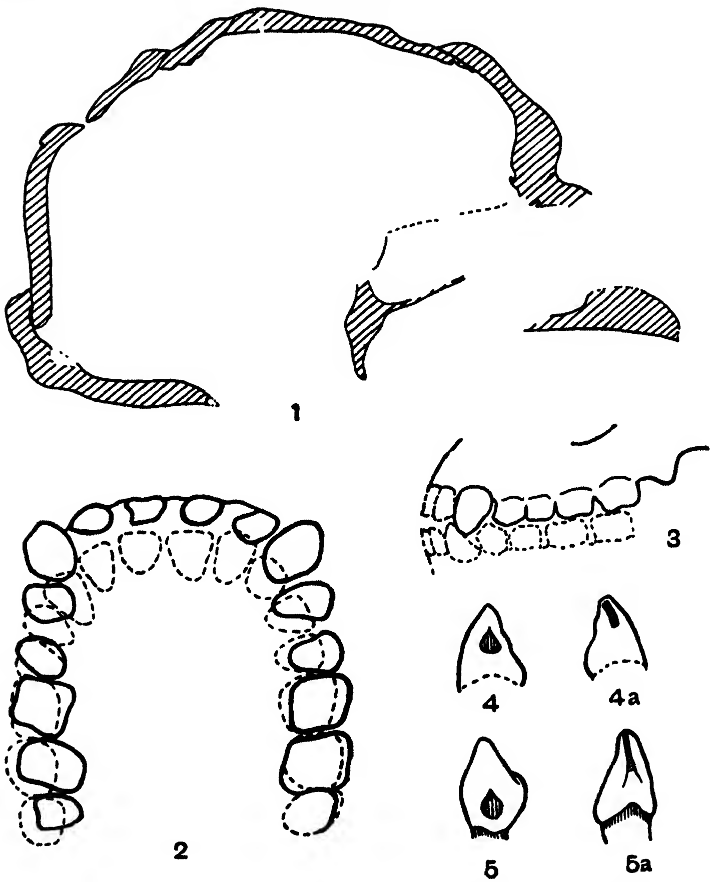

FIG. 159.—The fossil skull from Talgai, Queensland. 1. Sagittal section; 2, dentition of the upper jaw (continuous lines) compared with that of an Australian (dotted lines); 3, teeth of the upper jaw seen in profile; 4 and 4*a*, upper canine of the right side showing (4) the facet produced by wear against the lower canine and (4*a*) against the lower first premolar; 5 and 5*a*, corresponding tooth of an orang for comparison. (After S. A. Smith.)

jaw in much the same manner as in a large ape such as an orang (Fig. 159, 5).

Thus this primitive skull affords a parallel case,

though not so pronounced, to that which we have already encountered in Eoanthropus. The brain-case has acquired a thoroughly human form, while the jaw still retains some marks of the beast.[1]

The latest addition to our knowledge of the Australian comes from Prof. Dubois,[2] who has described as Proto-Australian two skulls which he obtained from Java in 1890. They differ from the skull of the existing inhabitants of Java in many characters by which they approach more nearly to the Australian. The lower jaw, although on the whole Australian, presents several points of resemblance to that of Mauer. The canine teeth of the upper jaw are similar to those of the Talgai skull and bear similar facets. Dubois, however, does not admit that these facets possess the significance attributed to them by Smith.

Though still in the hunting stage, the Australians, unlike the more isolated Tasmanians, have made a considerable advance on the Mousterian culture. This they may easily have accomplished by their own efforts, yet at the same time there can be no doubt they have borrowed much from adjacent races. The people of Torres Straits and New Guinea visit the mainland in their canoes and the Australians cross over to New Guinea; there is said indeed to be a regular traffic and there is a good deal of intermarriage. Besides this Malays voyage to the north-west coast in search of trepang.[3]

[1] The lower jaw is unfortunately missing. It will be remembered that this was the most surprising feature in Eoanthropus.

[2] Eugene Dubois, "The Proto-Australian Fossil Man of Wadjak, Java," *Proc. K. Akademie van Wetenschappen te Amsterdam*, vol. xxiii, No. 7, 1 pl.

[3] On the order in time of successive cultures see Graebner, *Anthropos*, vol. ix, 1909, p. 730; see also V. Giuffrida-Ruggeri, *Su l'origine dell' Uomo*, Bologna, 1923, p. 147 *et seq.*, for an exposition of Montandon's results.

Of course, like all other primitive tribes which have had the misfortune to occupy lands desired by the white man, this interesting people is dying out. Their best hunting-grounds are passing, or have passed already, into other hands, and they live on sufferance in infertile regions which the farmer cannot till and where sheep cannot graze. Fortunately, they have not received the same barbarous treatment as the Tasmanians. Shocking atrocities no doubt attended the early settlement of the country, but we have since protected the survivors in the humanest manner while quietly edging them out of existence.

The character of the aborigines has been much abused, for whenever the white man deprives a people of their land he repays them by conferring upon them an evil reputation that they do not deserve.

But if we turn to the impartial testimony of scientific inquirers we find that the Australian, much like ourselves, was a curious mixture of good and evil, and which of the two appeared to preponderate depended very much on the point of view of the observer.

Courageous in open warfare, he was timid in face of the unknown. He exposed the children he could not rear, but he was an affectionate father to those who were suffered to live. Though he might ill-treat a girl in order to possess her, he was a loving husband when she became his wife. He was a generous fighter and forbore his own advantage. He was hospitable, kind towards his relatives, and dutiful towards the aged. His intelligence was equal to his needs; it differed from ours, and in schools where white and black children were taught together, the advantage—oddly enough—was not on our side!

If as we have supposed the Tasmanians were driven

out of Australia by a Palæolithic race, now represented by the Australians, it is evident that primitive representatives of the two most divergent sub-divisions of the human family, that is, the Cymotrichi and the Ulotrichi, were already in existence at a very early date; and we shall soon encounter important evidence pointing to the existence of the Ulotrichi at a later period, that is, during Upper Palæolithic times, in Europe itself.

CHAPTER VIII

THE AURIGNACIAN AGE

THE classification of the various stages of human industry in the Upper Palæolithic succession has taxed the powers of investigators to the utmost. Until lately only two systems were generally recognised, the Solutrean and the Magdalenian of G. de Mortillet [1]; but this classification was rudely disturbed by the famous discoveries of Edouard Piette, and has since been modified by the introduction of a new or rather resuscitated system known as the Aurignacian, which has absorbed the greater number of the stages previously included in the Solutrean.

The brilliant researches of Messrs. Cartailhac, Breuil, Capitan, and Peyrony have established the new system on a firm basis and under the powerful advocacy of the Abbé Breuil [2] it has now attained general recognition, to the great advantage of our science, which is thus relieved of long-standing anomalies and provided with a necessary condition for further progress.

The Azilian is another system which, now that we know more about it, cannot be excluded from the upper Palæolithic series, of which it forms the final term.

[1] G. de Mortillet, *Le Préhistorique*, Paris, 1883.

[2] H. Breuil, "Essai de stratigraphie des dépôts de l'âge du renne," *Congr. préhist. de Fr.*, Perigueux, 1905, p. 75; *ibid.*, "L'Aurignacien présolutréen : Épilogue d'une Controverse," *Revue préhistorique*, iv, 1909, Nos. 8 and 9, pp. 46. For an interesting summary of this controversy see J. Déchelette, *Manuel d'Archéologie*, Paris, 1908, i, pp. 116–119.

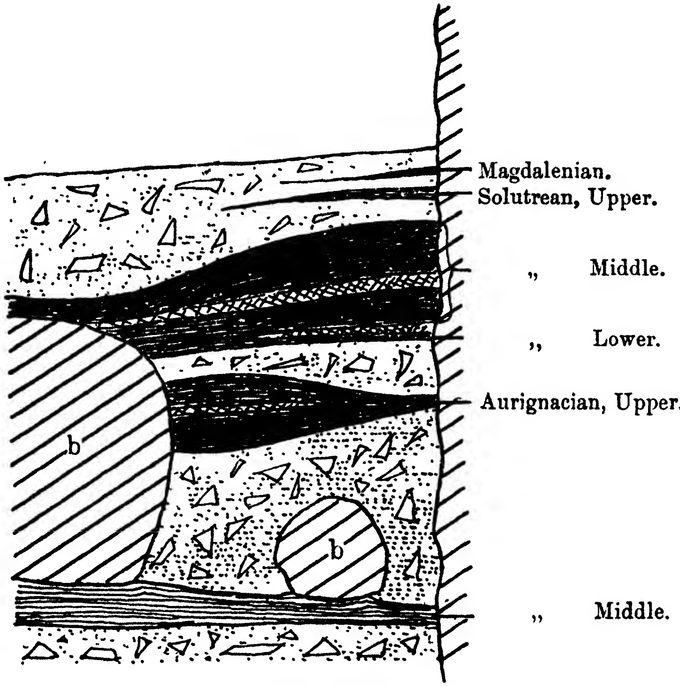

FIG. 160.—Section through the deposits of the rock shelter du Ruth, Dordogne; *b*, *b*, fallen-blocks of stone. (After the Abbé Breuil.)

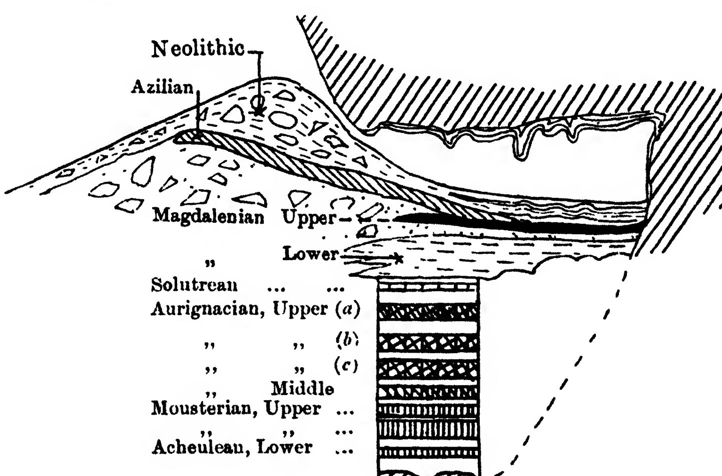

FIG. 161.—The Cueva de Castillo; section of the deposits of the floor. The spaces intervening between the industrial layers are sterile. (After the Abbé Breuil.)

The upper Palæolithic succession may be classified as follows :—

Northern Province.	Mediterranean Province.
Azilio-Tardenoisian	Tardenoisian.
Magdalenian, Solutrean	Upper Capsian.
Aurignacian	Lower Capsian.

These industries invariably succeed each other in the same order; the series may be incomplete and often is, but it is never inverted. Sometimes all the chief subdivisions are represented in the deposits of a single station. This is the case in more than one of the caves or rock shelters in France, as in Laussel or in the rock shelter of the Ruth [1] (Les Eyzies), for instance, where we have the section illustrated by Fig. 160.

In Germany a similar complete succession may be observed in the cave of Sirgenstein,[2] in Württemberg (Fig. 160).

In Northern Spain, another instance is afforded by the Cueva de Castillo,[3] Santander, as shown in the diagram (Fig. 161).

In England and Belgium all the subdivisions of the Upper Palæolithic are present; in Kent's Hole, Torquay, all the stages from the Mousterian to the Magdalenian appear to have been met with. The Aurignacian in particular is well represented.

The same succession may be followed over the greater part of Europe (Map, Fig. 164); but in the south, as in the greater part of Spain, almost the whole of Italy, and across the Mediterranean, as in Algeria and Tunisia or

[1] D. Peyrony, "Station préhistorique du Ruth, près Le Moustier, Dordogne," *Rev. de l'École d'Anthr. de Paris*, tom. xix, 1909.

[2] R. R. Schmidt, *Der Sirgenstein und die diluvialen Kulturstätten Württembergs*, Stuttgart, 1910.

[3] H. Obermaier, *El Hombre Fósil*, Comisión de Investigaciones Paleontológicas y Prehistóricas, Memoria No. 9, p. 173, Madrid, 1916.

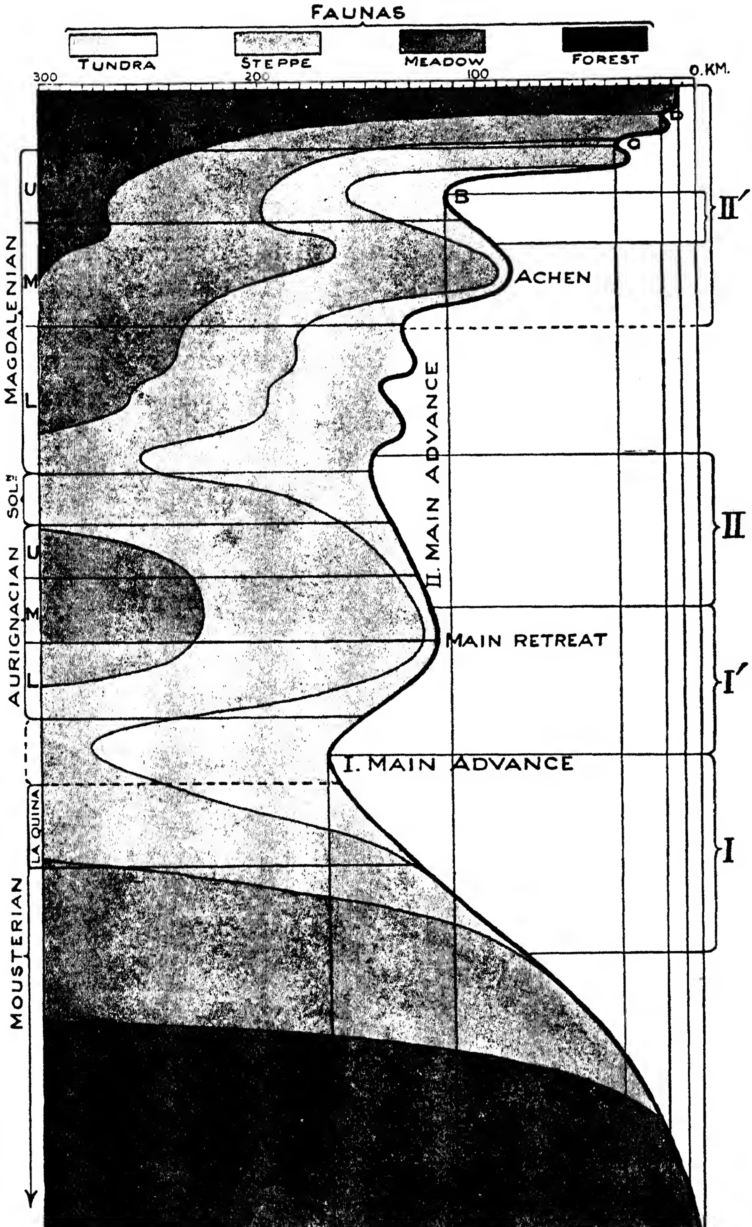

Fig. 162.—Movements of the Alpine ice-sheet and resulting displacements of biological zones correlated with the succession of the Monastirian industries. (After Soergel.)

at its eastern extremity in Phœnicia, there is a remarkable absence of the Solutrean and the Magdalenian; the Aurignacian, which assumes special characters, being succeeded immediately by the Azilian. The constancy of this phenomenon and the close alliance of the uppermost Aurignacian with the overlying Azilian have led the Abbé Breuil to suggest that the Mediterranean region was occupied by a people who practised an Aurignacian industry throughout the greater part of the Upper Palæolithic epoch; but since this industry possesses special characters of its own and persists throughout the Solutrean and Magdalenian ages it is necessary to distinguish it by a separate name, and it is known as the Capsian.

With the close of the Mousterian age the Neandertal species became extinct and new races of men belonging to a new species, *Homo sapiens*, entered into possession of the hunting grounds of Europe; but except for this one important change the fauna continues with remarkably little alteration from now on to the end of the Magdalenian age. The same kinds of animals occur, but in different proportions. At first primitive cattle and the horse were among the most abundant, afterwards the reindeer. The reindeer by its unfailing presence gives a special character to the whole of the Upper Palæolithic, which is therefore often spoken of by the French anthropologists as the epoch of the reindeer.

In the last chapter it was pointed out that the close of the Mousterian age was marked by the invasion of a cold fauna which closely resembles that now existing in the tundra of north-eastern Russia. In the Aurignacian fauna the cold-loving animals are not so numerous, sometimes only represented by occasional individuals, and the reindeer is rare during the middle

of the period, while the bison, horse, cave lion, and cave hyæna are comparatively abundant. It would seem, therefore, that an amelioration of climate had supervened, corresponding, no doubt, with a temporary retreat of the ice during the middle of the last Glacial episode (Upper Monastirian).

The fluctuations of the ice sheets during Upper Monastirian times and their correlation with the industries and biological provinces of the period have been admirably worked out by Soergel,[1] whose conclusions are embodied in the accompanying diagram (Fig. 162).

A glance at this will enable us to understand the greater frequency with which stations of human occupation, most of them Aurignacian, are now met with in the open country. They occur buried in the löss, so that the Aurignacians have sometimes been termed the "löss men."

The löss has already been described (p. 144).

It is in the younger löss that Aurignacian remains are found. The most famous localities are Krems on the Danube; Willendorf, on the same river, 20 kilometres above Krems, and Brünn in Moravia. Stations also occur in Bohemia, Hungary, and as far east as Russia (Kiev, Ukraine): they are also met with in Germany.[2]

In the well-known section at Crayford on the Thames (Fig. 163) two brick-earths, an upper and a lower, separated by a bed containing *Corbicula fluminalis*, have long been known.[3] Commont recognised them as the upper and lower löss; in the lower löss implements

[1] W. Soergel, *Lösse, Eiszeiten und Paläolithische Kulturen*, Jena, 1919.

[2] R. R. Schmidt, "Das Aurignacien in Deutschland," *Mannus, Zeits. f. Vorgeschichte*, 1909, i, pp. 97–120, in particular pp. 111–118; R. R. Schmidt and P. Wernert, "Die archäologischen Einschlüsse der Lössstation Achenheim (Elsass) und die Paläolithischen Kulturen des Reintallösses," *Die Prehistorische Zeitschrift*, 1910, ii, pp. 339–346.

[3] H. J. Spurrell, *Quart. Journ. Geol. Soc.*, xxxvi, p. 544, 1880.

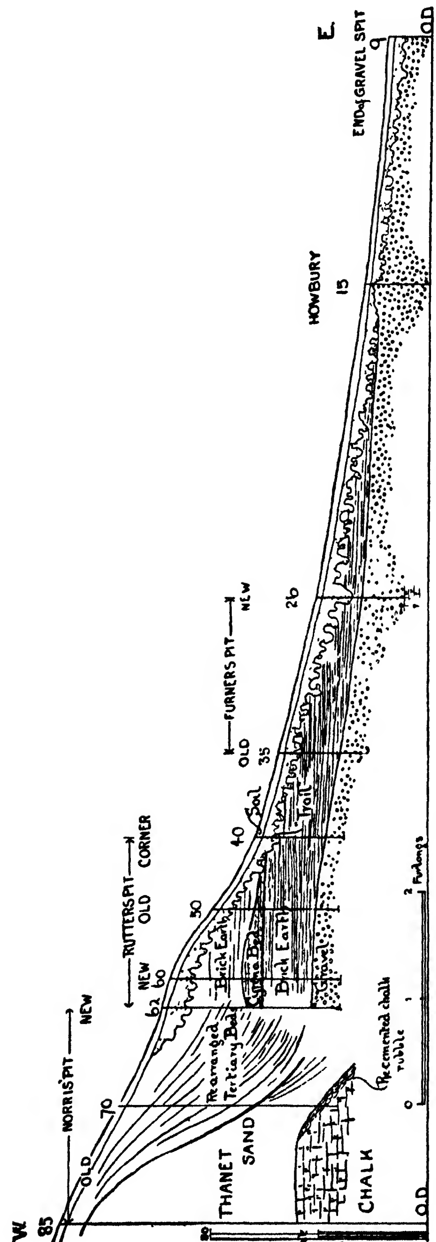

Fig. 163.—Section of the Crayford terrace. (After R. H. Chandler.)

stated to be Mousterian occur. If this is so they are almost certainly not in place. In the upper löss of Foots Cray Mr. Chandler[1] has found Aurignacian implements.

Although these stations have afforded many valuable

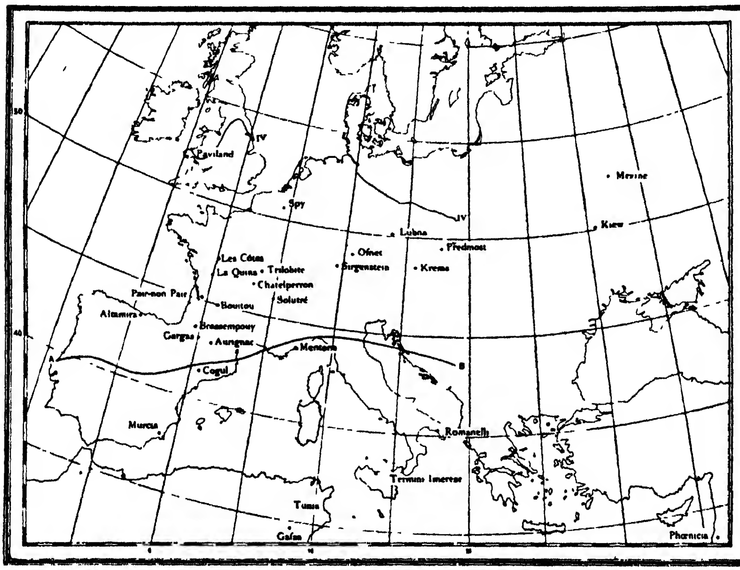

FIG. 164.—Distribution of Aurignacian stations in Europe. The line A, B divides the Northern from the Mediterranean or Capsian province. The line IV is supposed to mark the southern boundary of the ice during the Solutrean age.

facts, our chief source of information is still to be found in caves.

These are widely distributed in France, and are known also in Belgium, Germany and Spain (see Map, Fig. 164). In our islands there are several caves which have afforded Aurignacian implements, and there is one in particular—to which the late Prof. Cartailhac first directed my attention—which is rich in relics of

[1] R. H. Chandler, *Proc. Geol. Assoc.*, xxv, p. 61, 1914; and R. B. Higgins, *Man.*, xiv, p. 4, 1914.

this age. This is the cave of Paviland, which opens in a lofty cliff facing the sea between Oxchurch Bay and Worms Head. After some preliminary investigations by Mr. L. W. Dillwyn and Miss Talbot it was explored by Prof. Buckland [1] and found to contain a Palæolithic

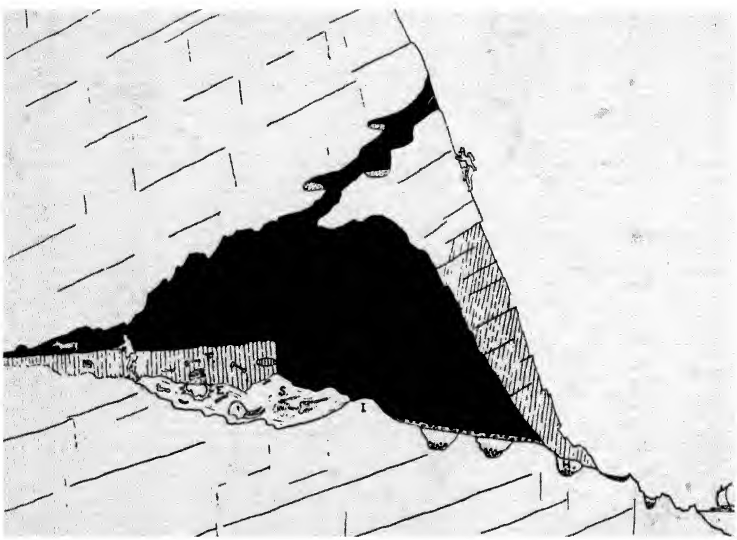

FIG. 165.—Section of the Paviland Cave, Gower, South Wales (after Buckland). S, the remains of a human skeleton. H, holes worn by the sea.

fauna, including the mammoth, woolly rhinoceros, reindeer, great Irish deer, bison, hyæna, horse, and cave bear, the last two being the most abundant. Many implements and other objects in bone and ivory lay scattered through the cave earth, and at one spot (Figs. 165 and 166, *s*), buried six inches deep, lay part of a human skeleton, "extended in the usual position of burial." This has been known ever since Buckland's

[1] W. Buckland, *Reliquiæ Diluvianæ*, 1823, pp. 82–83.

time as the "Red Lady" of Paviland. Unfortunately the skull and the greater part of the right side were missing. The bones were embedded in ruddle, or red micaceous iron ore, which has coloured the surrounding

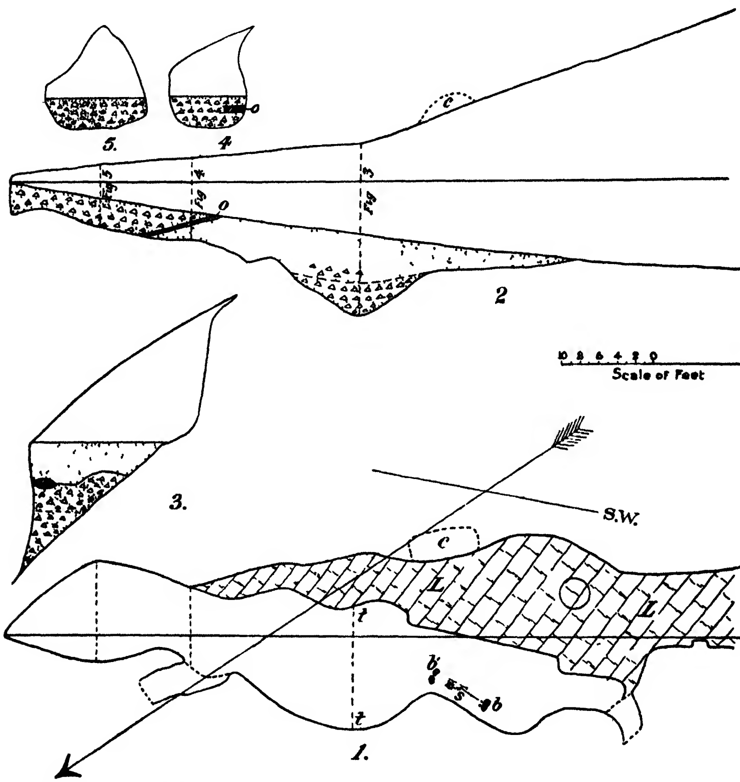

FIG. 166.—Plan and sections of Paviland Cave. 1. Plan of the floor, *b*, *b′*, limestone boulders; *s*, position of the skeleton; *L*, limestone not covered with cave earth; *c*, chimney leading to the surface. 2. Longitudinal section; *o*, band of ochreous clay. 3–4–5, Transverse sections.

earth for half a yard round. The body must have been enveloped and completely buried up in this material, and the bones, which, together with the associated objects are preserved in the University Museum, Oxford, are still encrusted with it. By its side, at the spot where

we carry the trousers pocket, lay two handfuls of periwinkle shells (*Natica neritalis*) and the ivory implements lay next its ribs. Towards the middle of the cave the floor had been disturbed before Buckland's visit, and bones of the extinct fauna were found overlying a more recent deposit containing the bones of sheep, and this has led to the suspicion that the skeleton may be of more recent date [1] than the implements associated with it.

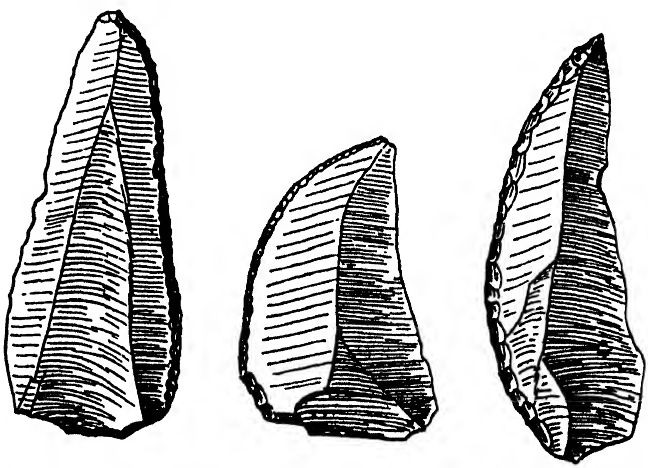

FIG. 167.—Precursors of the Châtelperron point from l'abri Audi. (After Breuil. × ⅔.)

Buckland, however, states definitely that the part of the skeleton remaining in place had not suffered from the disturbance which had removed the rest. Paviland cave has since been investigated by the Abbé Breuil and the author,[2] who has completely eviscerated it. The results show that it was occupied by man throughout the whole of the Aurignacian age and even longer.

[1] W. Buckland, *loc. cit.*; W. Boyd Dawkins, *Cave Hunting*, London, 1874, p. 232. See also *Reliquiæ Aquitanicæ*, p. 93.

[2] "Paviland Cave: An Aurignacian Station in Wales," *Journ. R. Anthrop. Inst.*, 1913, xliii, pp. 325–374, pls.

The Aurignacian Hunters.

The climate had to some extent relaxed its rigour and man continued his struggle with the environment under more genial conditions. Signs of progress make themselves increasingly evident in more directions than one.

In the first place the growing improvement in the art of working in flint, which has already been noticed in the Mousterian, still continues.

It is true that the earliest implements (Fig. 172) such as are found in the abri Audi show great poverty in design and workmanship, and Mousterian influence still survives; but very soon, as in the industry of Châtelperron, we recognise a marked advance. The caves of Châtelperron, which have furnished the typical implements of the Lower Aurignacian horizon, are situated on the left bank of the rivulet de Châtel in the department of the Allier. The chief implements are burins, side scrapers (racloirs), end scrapers (grattoirs), and knife-like blades known as the Châtelperron point (Fig. 168).

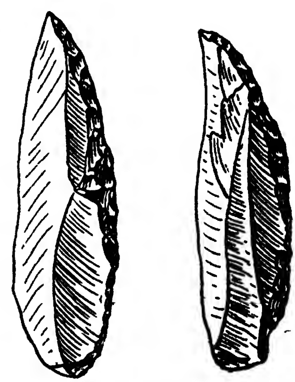

FIG. 168.—The Châtelperron point. (After Breuil.)

The burin was a very important tool; by its means deep incisions could be scored in hard material. With two such incisions running in a parallel direction, but inclined so as to meet when sufficiently deepened, neat strips could be cut out of bone or reindeer's horn. It presents us with many varieties of form; one of the earliest to make its appearance is the lateral burin. This is characterised by the removal of a longitudinal

flake from the side of a dressed flint so as to obtain a facet—the burin facet—which intersects the terminal face at about a right angle (Fig. 169, *e*). The line of intersection is the working edge: when worn out it can

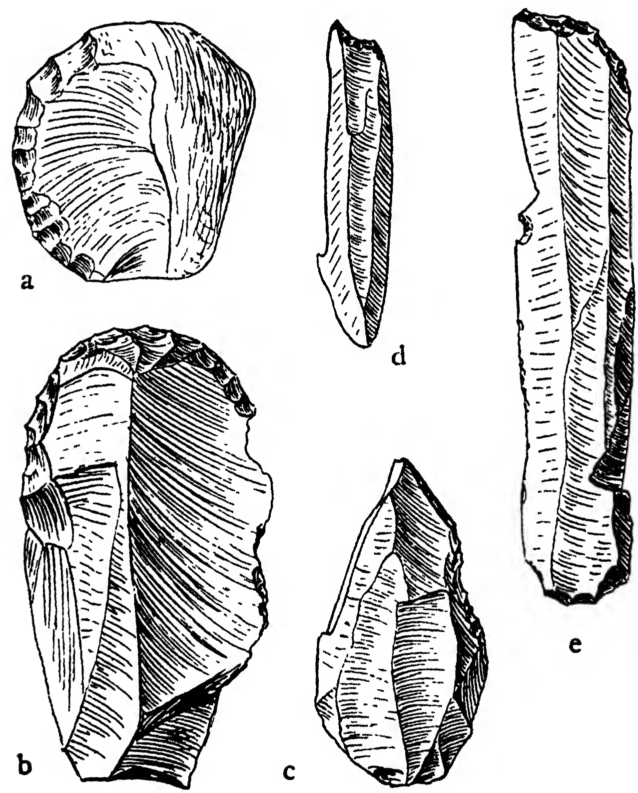

FIG. 169.—Lower Aurignacian of Châtelperron. *a*, racloir with curved edge; *b*, grattoir; *c*, burin (a precursor of the grattoir-burin of the Middle Aurignacian); *d*, *e*, corner burins.

be easily renewed, or rather replaced, by striking off a second flake parallel to the first (Fig. 170), or otherwise by taking off a flake from the end at right angles to the original burin facet, but in some cases this plan has the disadvantage of unduly shortening the implement.

One other kind of burin (*burin en bec de flûte*) makes its first appearance in the Lower Aurignacian to become later the classic tool of the Magdalenian. We may distinguish it as the "straight" burin (Fig. 169, *c*). The working edge, which is perpendicular to the general plane of the flake, is formed by two facets which meet at an acute angle. With this implement it would have been possible to cut into shape skin garments.

The racloirs or side scrapers (Fig. 169, *a*) of the period are short rude flakes retouched along a curved edge in a manner markedly different from that we are familiar with in the Mousterian. There the flaking is complex, first large scales are taken off and then smaller ones; here it is simple, small rather narrow flakes are removed in a single series. This is the essence of the Aurignacian retouch.

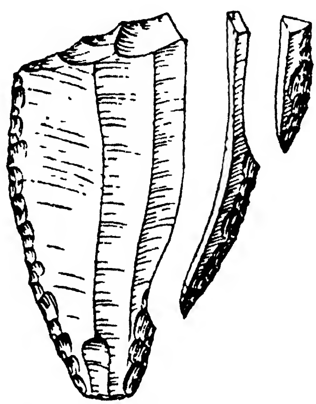

FIG. 170.—Lateral burin, to show the method of renewing the working edge. (After Bouyssonie and Bardon.)

The grattoirs or end scrapers are generally short and rough, sometimes broader than long, sometimes the reverse (Fig. 169, *b*).

The implement which especially characterises the Lower Aurignacian is the Châtelperron point (Fig. 168): it resembles a broad-bladed penknife; the back, which is strongly curved, has been beaten down and blunted by vigorous almost vertical retouching; the cutting edge is straight and ends against the back in a sharp point. Some of these points would make excellent arrow-heads.

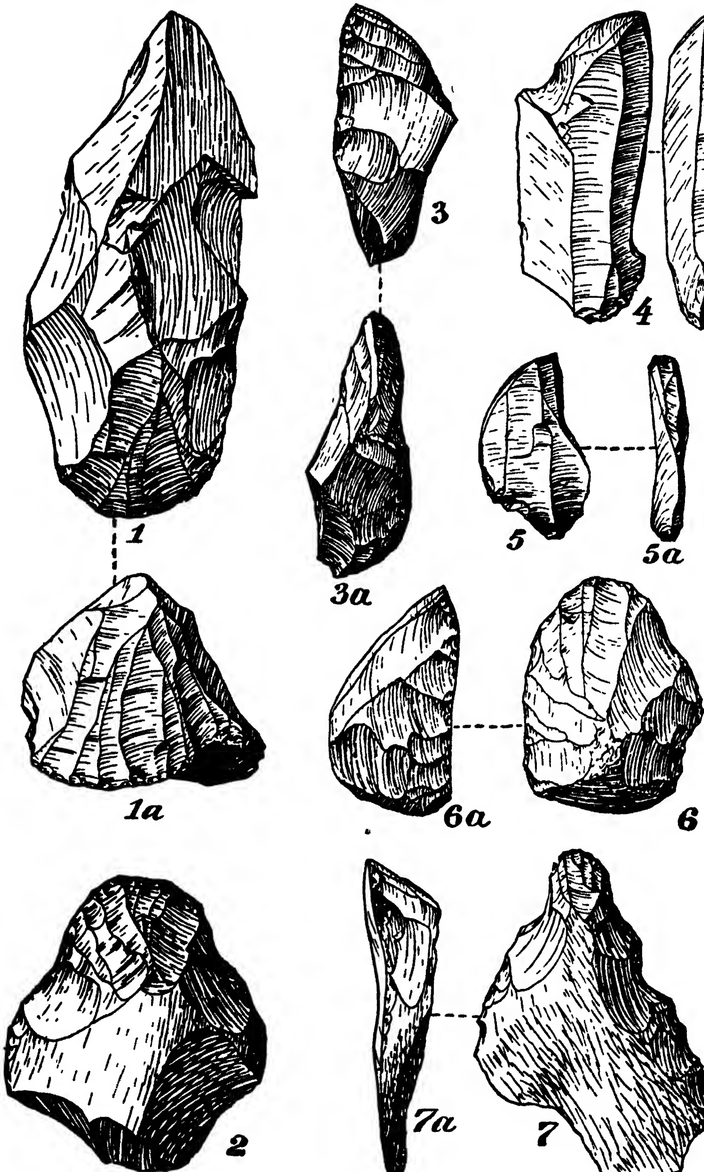

Fig. 171.—Scrapers and gravers, from the middle Aurignacian of La Coumba-del-Bouitou (Corrèze). 1, 2, 6, 7, keeled scrapers from the lower hearths; 4, a beaked burin; 3 and 5, forms linking the keeled scrapers with the beaked burins; 3, 4, and 5, from the upper hearths. (After Bardon and Bouyssonie. × $\frac{3}{5}$.)

It is in the Middle Aurignacian, however, that the Aurignacian art of working in flint attained its highest expression. The certainty and elegance of the retouch are admirable and new forms make their appearance in great variety. It would seem that the workman was

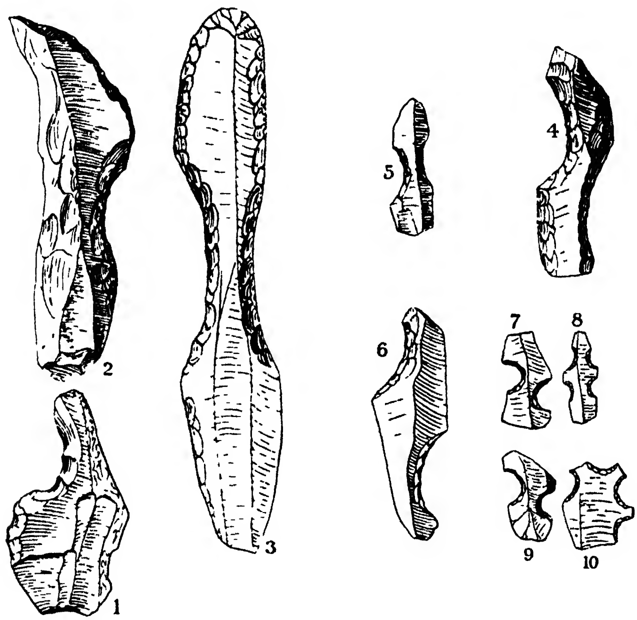

FIG. 172.—Aurignacian spokeshaves. 1, 2, *Lower Aurignacian.* 1, from l'abri Audi; 2, from the horizon of l'abri Audi at Le Moustier. 3 to 5, *Middle Aurignacian.* 3, Strangulated spokeshave from the lower part of the middle division Les Cottés (Vienne). 4, 5, from Krems, Austria. 6 to 10, *Upper Aurignacian*, from the caves of Grimaldi. (6 to 10 after Cartailhac, the remainder after Breuil. × $\frac{4}{5}$.)

now occupied with tasks which caused him to appreciate the value of specialised tools.

Of the many kinds of grattoir the most characteristic is the *grattoir caréné* or keeled scraper, sometimes known as the Tarté type.[1] It is thick, short, and high, with

[1] Forms not unlike this reappear in the Magdalenian and in Neolithic times, and have not infrequently deceived the unwary.

fluted secondary flaking, which is sometimes concentrated at one end, so as to produce a sort of snout (Fig. 171, 1, 2, 7). Many varieties of it are known, and a special memoir has been devoted to their description.[1] Closely allied to the carinated scrapers is the beaked burin (*burin busqué*), a graver's tool, with the graving edge bounded on one side by a plane and on the other by a curved convex surface (Fig. 171, 4) carefully flaked like the snout of the keeled scraper. On the side opposite the graving edge there is usually a notch with fine secondary flaking intended apparently to offer a hold for the fingers.

Besides these tools there are sharply pointed awls and notched scrapers or spokeshaves (Fig. 172); some with only a single notch, some notched on each side.

All these implements are distinguished by the regularity and fineness of the secondary flaking, which is specially known as the "Aurignacian retouch." In their general form they reveal a greater feeling for symmetry.

Towards the close of the period, in the Upper Aurignacian, the work did not quite maintain the same degree of excellence; still, even at this stage, a new form of implement came into use. This is a knife-like flake known as the Gravette point (Fig. 173). It is long, straight, and parallel-sided, generally triangular in section, with one edge completely removed by minute and thorough retouching. It differs from the Châtelperron point of the Lower Aurignacian, with which it

[1] Abbés L. Bardon, A. et J. Bouyssonie, "Grattoir caréné et ses dérivés," *Rev. mensuelle de l'École d'Anthr. de Paris*, 1906, p. 401, and "Station préhistorique de la Coumba-del-Bouïtou, près Brive (Corrèze)," *Bull. Soc. sci. hist. et arch. de Corrèze*, 1907–1908, 54 pp. A remarkable collection of these forms is exhibited in the Museum at Perigueux.

may be confused,[1] by its greater straightness, elongation, and narrowness, as well as by its more acute point. There is a difference also in the retouch, which is more regular and finer in the Gravette point, and is almost constantly directed from below upwards. In the Châtelperron point it sometimes follows this direction, but sometimes the opposite from above downwards. (The flat of the blade is regarded as the lower surface, the longitudinally facetted side as the upper surface.) However acute the point, and in some cases its sharpness is extreme, the retouch is always continued along the back right up to the extremity.

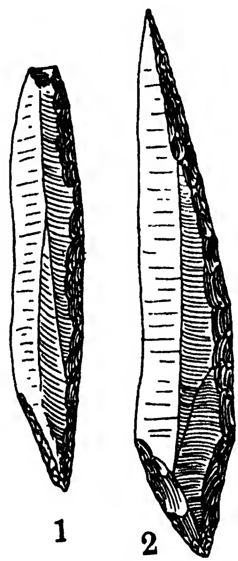

FIG. 173.—The Gravette point. (After Breuil. × ⅔.)

As pointed out by the Abbé Breuil, the Gravette point sometimes passes into very diminutive forms, as for instance at Font Robert (Corrèze) (Fig. 174), and again in Paviland (Fig. 175). Among some specimens from Paviland kindly lent me by Dr. Cunnington, is one of these small forms; small as it is the retouch is as perfect as in the larger examples, and is carefully maintained from base to point. Accompanying it is a diminutive spokeshave.

Such a multifarious equipment of tools as we meet with in the Aurignacian deposits implies that the workman exercised his skill in many different handicrafts, and all the facts to which we now pass support this

[1] H. Breuil, "Les Subdivisions du Paléolithique supérieur et leur Signification," *Compte Rendu de la XIVe Session, Genève,* 1912, *Congrès International d'Anthropologie,* i, p. 165; see in particular Fig. 1, Nos. 6 to 9.

inference; they show that the Aurignacian hunter was already familiar with the principle of the saw, the graver, the spokeshave, racloir, grattoir, and drill; but much of his work was accomplished on perishable material, and he probably produced a whole host of objects—spears,

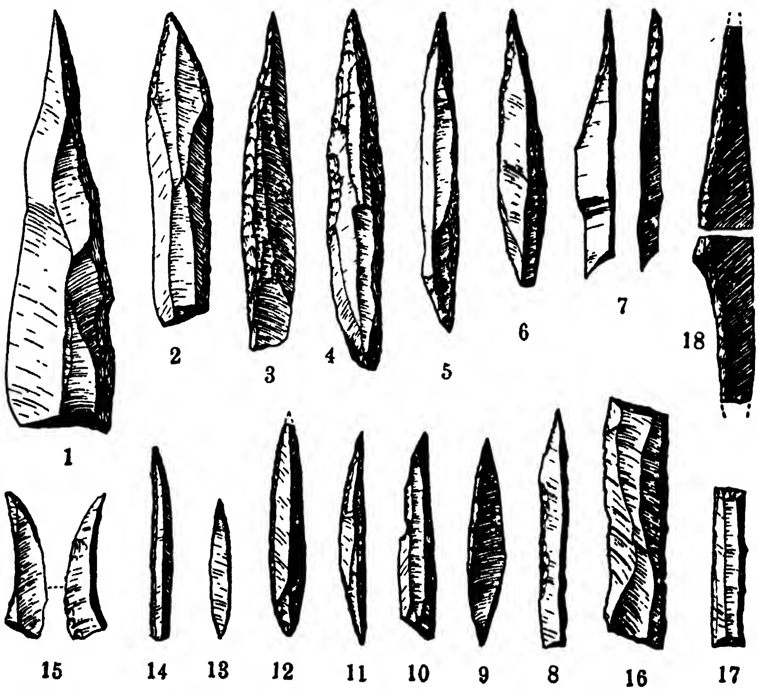

FIG. 174.—Forms derived from the Gravette point. 1 to 7, 9 to 14, and 18 from Font Robert (Corrèze). The shoulder in No. 18 suggests that this is a precursor of the pointe-à-cran. 8, 15, 17 from the Grotte Lacoste. (From Breuil, after Bardon and Bouyssonie. × ⅔.)

bows and arrows, digging sticks, thongs of hide, fur garments, basket work and nets—of which no trace has been or could be preserved.[1]

A great advance is signalised by the introduction of

[1] Since this was written the Acheulean spear-head already alluded to (p. 195) has been found, and the wall-paintings of Capsian age in Spain have provided us with pictures of clothing, a basket and bows and arrows.

a new material. A use has been found for bone, which while tougher and less brittle than flint, is capable of taking a fine point. Rude awls of bone and skewers of ivory are sparingly found in the Lower Aurignacian; later on, in the Middle and Upper Aurignacian, the awls, which are carved out of the metacarpal bones of the horse or reindeer, are better shaped and the knuckle end of the bone is left to form a handle; those made from splinters of ivory are symmetrical in shape and sharply pointed; bone and ivory spear-heads make their appearance along

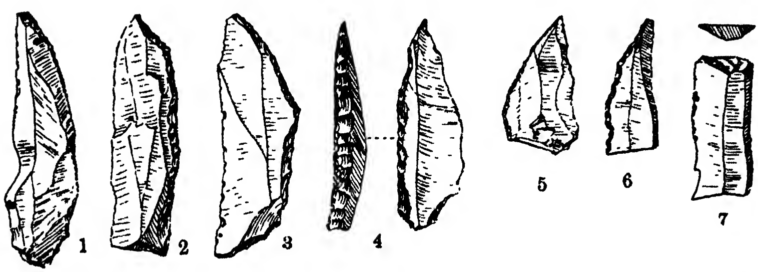

FIG. 175.—The Gravette point and its derivatives from Paviland. (× $\frac{2}{3}$.)

with other objects, so that altogether we are presented with a rather rich and varied industry.[1] The Middle Aurignacian is especially distinguished by the occurrence of a bone point with a bifid base (*la pointe à base fendue*), the Aurignac bone point, which is sometimes regarded as an arrow-head (Fig. 176). Its forked extremity hardly seems strong enough, however, for such a weapon,

[1] H. Breuil, "La Grotte des Cottés," *Rev. de l'École d'Anthr.*, Paris, 1906, pp. 47–62. R. R. Schmidt, *Der Sirgenstein und die diluvialen Kulturstätten Wurttembergs*, Tubingen, 1909, p. 46; "Die paläolithischen Kulturepochen in Deutschland," *Korrespondenzblatt f. Anthr.*, 1908, pp. 1–8, sep. copy; "Die vorgeschichtlichen Kulturen der Ofnet," *Ber. d. Naturwiss. Vereins f. Schwaben u. Neuburg*, 1908, pp. 87–107, pls.: "Das Aurignacien in Deutschland," *Mannus, Zeits. f. Vorgeschichte*, i, 1909, pp. 97–110, pls.; R. R. Schmidt and P. Wernert, "Die Archæologischen Einschlüsse der Lössstation Achenheim i. Elsass," *Prahistorische Zeits.*, 1910, ii, pp. 339–346; Capitan and Peyrony, "Station préhistorique de la Ferrassie," *Rev. Anthropologique*, 1912, xxii, pp. 27–50 and 76–99.

and the Abbé Breuil is no doubt correct in his conjecture that it served as a bodkin for carrying a skin thong.

A large collection of bone implements has been obtained by M. Didon [1] from the Aurignacian station of l'Abri Blanchard (Dordogne). Some of these anticipate in a remarkable manner implements of Magdalenian age, differing chiefly by their greater simplicity and lack of ornament. Shaft-straighteners, for instance, occur (Fig. 177) very similar to the so-called "bâton de commandement" of the Magdalenian, and yet still more like the arrow-straighteners of the Baffin Land Eskimos as described by Dr. Boas.[2] They are made of reindeer horn, through which a cylindrical hole has been drilled to grip the shaft of the arrow or lance, as a preliminary to straightening it; in two of the specimens this hole is comparatively large, 21 mm. in diameter (Fig. 177, *C*) and 24 mm. (Fig. 177, *B*), just the size for a lance; in another (Fig. 177, *D*) it is only 10 mm., and makes an excellent fit for an arrow. The hole in each case traverses the implement obliquely, so as to give a better hold on the shaft, with less risk of bruising while bending it straight. The ridges left by the drill are still visible on the sides of the holes, except in those places where they have been worn away by use.

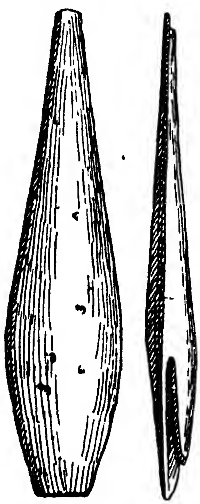

FIG. 176.—The Aurignacian bone point. (After Déchelette. × about ⅓.)

There are also some bone rods, of which one at

[1] L. Didon, "L'Abri Blanchard des Roches (Commune de Sergeac)," *Bull. Soc. Hist. et Archæologique du Périgord*, 1911, 45 pp., pls., sep. copy.

[2] Franz Boas, "The Eskimos of Baffin Land and Hudson Bay," *Bull. Am. Mus. Nat. Hist.*, xv, Fig. 117, 1901.

least resembles in the closest manner some examples of the Eskimo bow drill; in shape and size it presents no essential difference, and it is perforated at one extremity; the other is broken off so that we do not

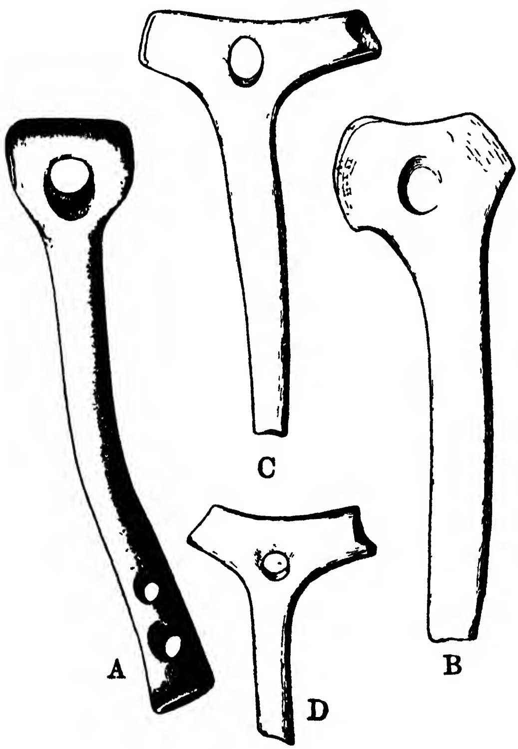

FIG. 177.—*B*, *C*, *D*, Aurignacian shaft-straighteners in the collection of M. Didon; *A*, an Eskimo's shaft-straightener described by Dr. Boas. (× about ⅓.)

know whether it was perforated or not, but this is a matter of little consequence, for the primitive Eskimo bow-drills are not infrequently perforated at one extremity only (see Fig. 302, *g*, on p. 539).

The human delight in personal adornment is already manifest in Aurignacian times. The simplest and

commonest ornaments were natural objects, such as sea-shells, backbones of fish, teeth of reindeer, wolves or foxes, which are perforated for stringing into a necklace or sewing on to some article of clothing; but besides these we find trinkets of one kind or another which are more elaborated and may be fairly termed manufactured products. Polished ivory, so pleasing to the sight and touch, was much appreciated. Pendants of various kinds, such as the ivory fish-like form from the Abri Blanchard, were carved out of this material. Beads of ivory and reindeer's horn are also met with; over 200[1] of these, some surprisingly small, only 2 mm. in diameter, the largest not more than 8 mm., have been obtained from the same station, which seems to have been a veritable bead-manufactory.

From the waste products scattered through the cave earth it has been found possible to trace the process of manufacture in all its stages. To begin with a cylindrical rod was prepared; no doubt by cutting out a strip from a reindeer's horn or a mammoth's tusk with a burin and then rounding it with a spokeshave. The rod was then ringed all round at regular intervals with deep notches (*a*, Fig. 178), and the segments so produced were separated in pairs (*b*, Fig. 178). Each segment was made thinner at one end by paring it away on two opposite sides (*c*, *d*, Fig. 178) as a preliminary to drilling a hole through it (*e*, Fig. 178). The beads were finally separated and when the rough ends had been rounded off they were ready for the thread (*f*, Fig. 178). These beads are characterised by a broad base, but there were others which are perfect little

[1] L. Didon, "Faits nouveaux constatés dans une Station Aurignacienne des environs de Sergeac," *C. R. Congrès internat. d'Anthr.*, 1912, xiv, p. 337.

roundels (*g*, Fig. 178), like the commonest of our modern forms.

The earliest discovery of bone and ivory implements of Aurignacian age, though they were at first assigned to a later date, was made in Paviland Cave. Here were found bone awls, broken cylindrical rods, gently swollen at one end which may have been used as netting pins; a tongue-shaped body or "lissoir" used for polishing; and some points which may have been arrow-heads. Beads were absent, perforated wolves' teeth take their place, but in compensation there is a simple ivory bangle, or rather its fragmentary remains, (Fig. 179, 1) which when complete and fresh must have been a really beautiful object.[1] The Grotte du Placard[2] has afforded from a Solutrean horizon a fragment of a similar ring, but ornamented by a regular series of little incisions notched across the sides (Fig. 179, 2). This is just large enough to admit a young lady's hand. Part of a smaller ring,[3] too small for a bracelet (Fig. 179, 4), has been found in the Aurignacian deposits of the Grotte de Spy.

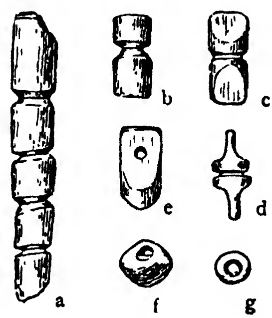

FIG. 178.—Beads of ivory and reindeer horn in various stages of manufacture from the Middle Aurignacian of l'Abri Blanchard. (After Didon.)

To have carved these rings out of a solid mass of ivory would have been a remarkable feat, but the ingenious artist did not put himself to so much pains; he took advantage of the fact that the base of the

[1] Paviland Cave, *loc. cit.*
[2] A. de Mortillet, "Bracelets paléolithiques en ivoire," *L'Homme préhistorique*, 1907, v, p. 142.
[3] *Ibid.*, p. 144.

mammoth's tusk is hollow, and to obtain a ring all that he had to do was to saw it across in this region by parallel cuts (Fig. 180). A ring roughed out in this stage

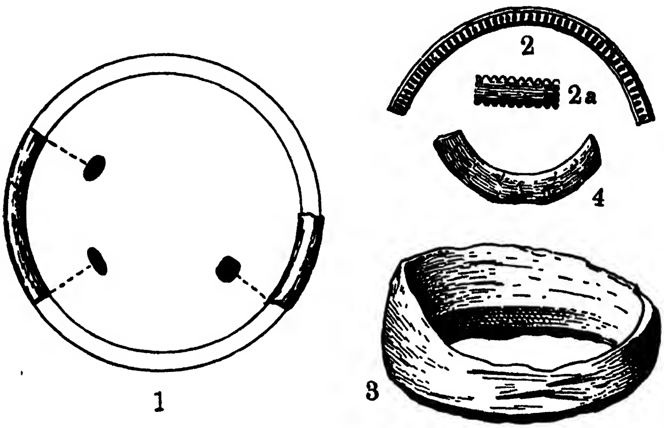

FIG. 179.—Ivory rings. 1, Aurignacian, from Paviland; 2, 2a, Solutrean, from the Grotte du Placard; 3, segment of mammoth's tusk, Grotte du Placard; 4, fragment of ring from Aurignacian of the Grotte de Spy.

has been found in the grotte du Placard (Fig. 179, 3).[1] With racloirs and spokeshaves the edges of such a ring could be readily scraped away and the final polishing might have been done with fine smooth sand.

FIG. 180.—Diagram to show how ivory rings were obtained from a mammoth's tusk.

One of the most remarkable ivory objects found at Paviland in 1912 is an egg-shaped body—about as large as a duck's egg—with a little process at one end which has been perforated for suspension (Fig. 181, B). In its

[1] A. de Mortillet, *loc. cit.*

original state this was evidently a nodular growth which had formed as the result of a wound in the pulp cavity of a mammoth's tusk. So singular an object was probably kept as a charm and credited with strong magic powers. By an odd piece of luck, Buckland, in his exploration made nearly a century earlier, had discovered

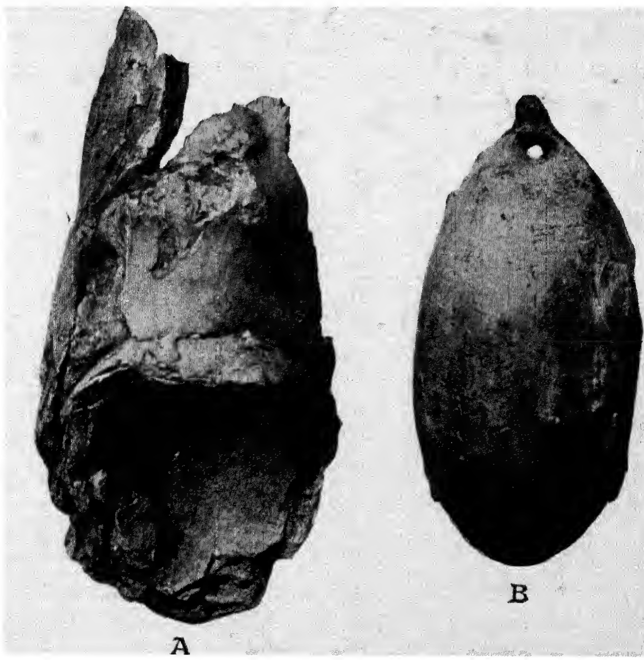

Fig. 181.—B, egg-shaped nodular growth perforated for a pendant. A, part of mammoth's tusk in which it was formed. From Paviland Cave.

the wounded part of the identical tusk (Fig. 181, A) to which the nodule owed its origin.

M. Didon's collection contains the image of a phallus,[1] about life-size, carved in bison's horn, as well as representations of its counterpart. This will at once suggest

[1] It is said that the Australians carve similar representations in stone, *Anthropos*, 1913, viii, p. 556.

sympathetic magic; the cult of the Linga evidently extends far back in time.

Many of the bone implements were probably blocked out in the rough by various forms of flint implements specially devised for the purpose, and then finished by grinding down on stone. From the grinding of bone to that of stone does not seem a great step, but it was not taken till long afterwards, in the Neolithic period.

At first bone implements are very rare and simple in form, but accompanying them are objects sculptured

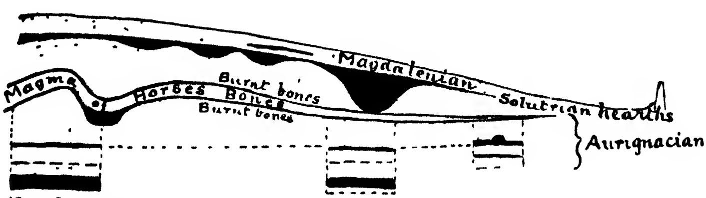

Fig. 182.—Section through the deposits of the rock shelter at Solutré. (After the Abbé Breuil.)

in the round or in low relief, of which we shall speak later.

Allusion has already been made to the life of the period. Europe at this time evidently teemed with game, which afforded a rich prey to the Aurignacian hunters. At Solutré, a station in the Rhône valley a little to the north of Lyons, where the horse seems to have been a favourite food, the broken bones of these animals, left as the refuse of many feasts, form a mass of breccia considerably over 100 yards in length and in places as much as 10 ft. thick (Fig. 182); and indeed most of the Aurignacian hearths seem to bear witness to a time of plenty. As a parallel among modern hunting races we may recall the observations made by Captain Harris when travelling in South Africa:

"In many places," he writes, "the ground was

strewn with the blanched skeletons of gnus and other wild animals which had evidently been slaughtered by Bushmen, and traces of these troglodytes waxed hourly more apparent as the country became more inhabitable. The base of one hill in particular, in which some of their caves were discovered, presented the appearance of a veritable Golgotha; several hundred skulls of gnus and bonteboks being collected in a single heap." [1]

The existence of arrow-straighteners (p. 364) implies the existence of the arrow itself and thus it would seem that Aurignacian man had already invented that powerful weapon—the bow. Armed with this he was able to take full advantage of the favourable circumstances by which he was surrounded. Life was easier and among its amenities may be counted a certain amount of leisure. Hence we now witness the birth of the fine arts. Sculpture and drawing almost simultaneously make their appearance, and the best examples attain to so high a pitch of excellence that enthusiastic discoverers have spoken of them as superior in some respects to the work of the Greeks. Sculptures in the round and in low relief, as well as a solitary instance of engraving on stone, were among the first to attract the attention of observers; but in the course of the last forty or fifty years a series of remarkable discoveries has brought to light whole picture galleries which begin with the Aurignacian and extend through the Magdalenian age. The first to set eyes on these was a Spanish nobleman, Marcellino de Sautuola, who, when visiting the International Exhibition in Paris of 1878, became acquainted with the discoveries made in the caves of Southern France, and was thus led to investigate some

[1] G. W. Stow, *The Native Races of South Africa*, London, 1905, p. 85.

Fig. 183.—Outlines of paintings on the roof of the cavern of Altamira (Magdalenian). (After Cartailhac and Breuil, *L'Anthr.*)

caves which exist near his own home in Santander. In one of these, the Cueva de Altamira, he found the usual palæolithic débris, bones of extinct animals, and worked flints, among them a laurel-leaf Solutrean point of coarse workmanship. While he was digging for these, his little daughter, who had accompanied him into the cave and soon grew tired of watching such an uninteresting performance, began to look restlessly about; suddenly her attention was arrested, and she cried out "Toros!" (bulls) "Toros!" she cried again; M. Sautuola stopped digging to ask her what she meant; she pointed upwards, and there on the roof of the cave he beheld a crowd of figures, some life-size, representing not only bulls (bison), but also horses, deer, and other animals, faithfully depicted in a great variety of attitudes (Fig. 183). M. de Sautuola lost no time in bringing this surprising discovery before the Archæological Congress of 1879, and published a full description in 1880.[1] It was received with the most profound scepticism. Subsequently M. L. Chiron observed outline drawings on the walls of a cave in the Ardêche, known as the Chabot, and his discovery was subsequently confirmed by Prof. Capitan. A few years later (1895) similar drawings were found by M. Rivière in the cave of La Mouthe,[2] and in the following year by M. François Daleau in the cave of Pair-non-Pair, in the Gironde.[3] In the Aurignacian layer of Pair-non-Pair, M. Daleau found the red oxide of iron which had furnished the pigment for the paintings on the walls, as well as the pestles of granite and quartzite which had been used for pounding it up,

[1] M. de Sautuola, *Breves apuntes sob. alcunos objetos prehistóricos de la provincia de Santander*, Santander, 1880, 8vo, 28 pp., 4 plates.

[2] E. Rivière, "La Grotte de la Mouthe," *Bull. Soc. d'Anthr.*, Paris, 1897, pp. 302, 484, 497.

[3] F. Daleau, "Les gravures sur rocher de la caverne de Pair-non-Pair," *Actes de la Soc. Archæ.*, Bordeaux, 1897, and *L'Anthr.*, 1898, ix, p. 66.

and several scapulæ daubed with red which seemed to have served for palettes.

These fresh observations did not produce conviction. This will not seem altogether unnatural when we consider the unexpected nature of the discoveries; the excellent state of preservation of the paintings, their remarkable merit as works of art, and the fact that they occur in the dark recesses of caverns far removed from the light of day, all combined to arouse suspicion. Nor must it be overlooked that malicious or foolish persons have not seldom attempted to impose upon investigators, sometimes with a passing success. When M. Rivière submitted his results to the Archæological Congress in 1897, they met with much unfriendly criticism. Yet the author had made a strong case; for he pointed out that some of the figures are covered by a fairly thick layer of stalactite; that the red clay which forms the floor of the cave extends above the lower part of some of the drawings so as to conceal the feet of the animals depicted; and, finally, that in their style, boldness of characterisation, and even in their faults they closely resemble the palæolithic drawings which have long been recognised on bone or ivory.

In a sympathetic review, written in the following year, M. Marcellin Boule [1] asserted that the arguments which had been opposed to the views of M. Rivière were without validity. At the same time, he hesitated to commit himself to a definite opinion.

It was not till 1901 that the general incredulity began to yield, partly in consequence of discoveries by Prof. Capitan and the Abbé Breuil, who described drawings and paintings from the cave of Font-de-Gaume

[1] M. Boule, "La Grotte de la Mouthe," *L'Anthr.*, 1898, ix, p. 676.

(Dordogne).[1] At the same time M. Rivière furnished fresh evidence from the cave of La Mouthe,[2] and M. Marcellin Boule, in a review[3] of the work of these authors, now recognised its convincing force. Finally, M. Cartailhac, who had been previously one of the most uncompromising opponents of the genuineness of the alleged discoveries, courageously admitted that he had been mistaken.[4] All doubts were now dispelled, and the subsequent progress of investigation has been accompanied by continually increasing discovery.[5]

In giving a brief account of these drawings we cannot do better than commence with the cave of Altamira, the

[1] Capitan and Breuil, "Une nouvelle grotte avec parois gravées à l'époque paléolithique," *C. R.*, September 16, 1901; and "Une nouvelle grotte avec figures peintes sur les parois à l'époque paléolithique," *C. R.*, September 23, 1901.

[2] E. Rivière, "Les dessins gravés et peints de la Grotte de La Mouthe," *Rev. Sci.*, October 19, 1901.

[3] M. Boule, "Les gravures et peintures sur les parois des cavernes," *L'Anthr.*, 1901, xii, p. 671.

[4] Émile Cartailhac, "Les cavernes ornées de dessins: La grotte d'Altamira, Espagne; 'Mea Culpa' d'un Sceptique," *L'Anthr.*, 1902, xiii, p. 348.

[5] É. Cartailhac and H. Breuil, "Les peintures et gravures murales des cavernes Pyrénéennes," I. Altamira (à Santillane, Spain), *L'Anthr.*, 1904, xv, p. 625; II. Marsoulas, près Salies-du-Salat, Haute Garonne, *L'Anthr.*, 1905, xvi, p. 431; III. Niaux (Ariège), *L'Anthr.*, 1908, xix, p. 15; IV. Gargas (Hautes Pyrénées), *L'Anthr.*, 1910, xxi, p. 129; and *La Caverne d'Altamira à Santillane*, 1 vol. 4to, pp. 287, 37 pls., Monaco. 1906 (published 1908); Capitan, Breuil, and Peyrony, "Les figures gravées à l'époque paléolithique sur les parois de la grotte de Bernifal (Dordogne)," *Rev. de l'École d'Anthr.*, Paris, 1903, p. 367; H. Breuil, "L'évolution de l'art pictural et de la gravure sur murailles dans les cavernes ornées de l'âge du Renne," *L'Anthr.*, 1905, xvi, p. 513; Peyrony, "Nouvelles récherches sur la grotte des Eyzies," *L'Anthr.*, 1905, xvi, p. 515; Capitan, Breuil, and Ampoulange, "Une nouvelle grotte préhistorique à parois gravées," abstract, *Rev. de l'École d'Anthr.*, Paris, 1904, x, p. 320; Capitan, Breuil, and Peyrony, "Une nouvelle grotte à parois gravées, La Calvitie (Dordogne)," *Rev. de l'École d'Anthr.*, Paris, 1904, p. 379; Hermilio Alcalde del Rio, *Las Pinturas y Grabados de las Cavernas prehistóricas de la Provincia de Santander*, Santander, 1906; H. Breuil, "Cavernes espagnoles peintes et gravées," *L'Anthr.*, 1906, xvii, p. 625; H. Breuil and C. Aguilo, "Les peintures rupestres du bassin inférieur de l'Ebre," *L'Anthr.*, 1909, xx, pp. 1–21; others to be referred to later.

starting-point of all subsequent discoveries. A plan of the cave is given below (Fig. 184), and reference to it will save a lengthy description. The finest collection of figures occurs on the roof of the recess (C) near the entrance. The earliest efforts seen there are outline drawings in black, some of which could scarcely be

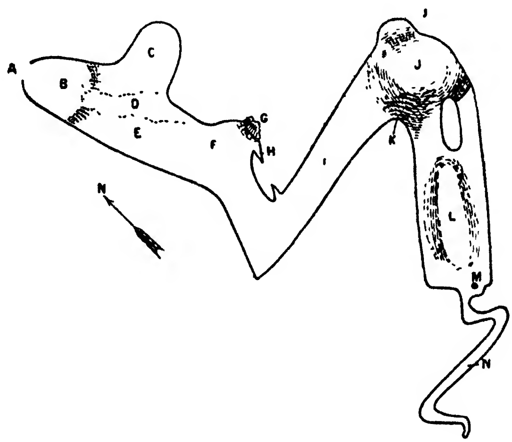

FIG. 184.—Plan of the cavern of Altamira. Drawn by M. Harlé.

Total length, 280 metres. A, entrance; B, vestibule half filled with kitchen débris and fallen fragments from the roof; C, chamber on the left, 40 metres long by 10 metres broad, with large paintings; D, fallen rocks; E, gallery on the opening into the chamber F, from which a cascade of stalagmite, G, covered with sculptures, descends to the left; H, a narrow diverticulum, with red figures on the walls, opening into F; I, gallery, with floor covered by fallen fragments from the roof; J, chamber with vaulted dome-like roof; K, cascade of stalagmite; L, elongate, nave-like chamber; M, shallow water pits; N, terminal passage. The figures occur over all the walls, but mostly on the roof of the chamber C.

better; these were succeeded by paintings in red wash, which are somewhat crude; then follow incised drawings, traced with a sure hand, and showing no signs of retouching. The admirable engraving of a bison (Fig. 185) which occurs outside the recess, on the wall of one of the galleries, probably belongs to this series. Last of all come the polychromes, which are rudimentary to

begin with, but subsequently attain a high degree of perfection.

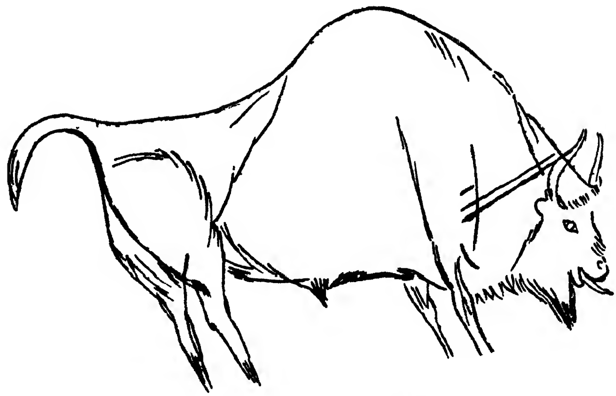

FIG. 185.—Engraving of a bison, Altamira (Magdalenian). (After Cartailhac and Breuil, *L'Anthr.*)

The greater number of the animals shown in Fig. 183 are polychromes of this kind. Where these occur there

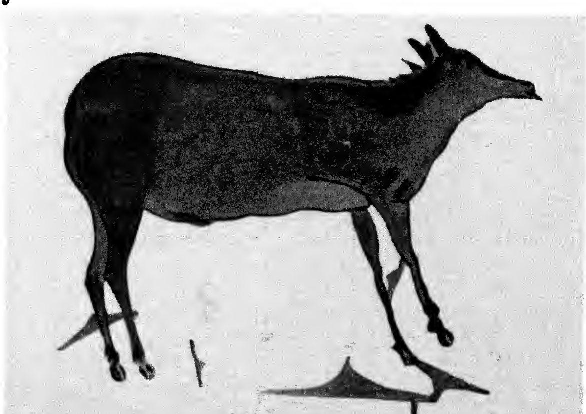

FIG. 186.—Polychrome painting of a deer, from the group shown in Fig. 183 (Magdalenian). (After Cartailhac and Breuil, *L'Anthr.*)

is evidence to show that the surface was prepared for their reception, previously existing paintings having been washed or scraped off. The outlines were first drawn in with black pigment, then the colours were put

on, tufts of hair on the mane and elsewhere being indicated by touches with a brush; the body colour was smeared on as a soft paste, extended and graduated

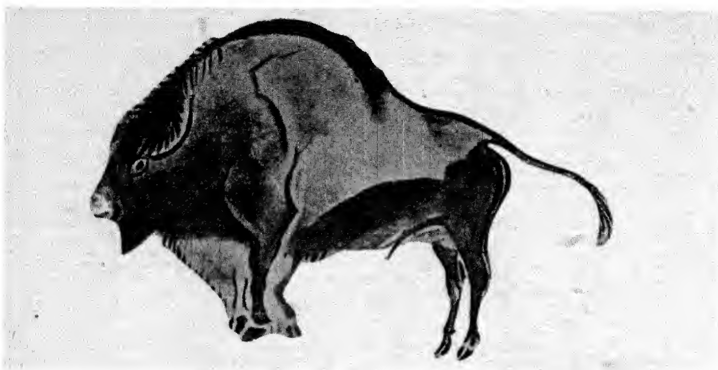

FIG. 187.—Polychrome painting of a bison, from the group shown in Fig. 183 (Magdalenian). (After Cartailhac and Breuil, *L'Anthr.*)

to give the half-tones, and then retouched by washing and scraping, bands of colour being removed to give the high lights and to bring the limbs out against the body

FIG. 188.—Sketch of Fig. 187, engraved as a preliminary to painting (Magdalenian). (After Cartailhac and Breuil, *L'Anthr.*)

(Fig. 186). In the latest and most finished examples, the brush has been assisted by the burin; the outline of Fig. 187, and even some of the detail, was engraved, as shown in Fig. 188 before it was emphasised with black

pigment. The different drawings and paintings are often superposed one above the other, and it is this which renders it possible to determine their relative age. In some parts of the cave there are strongly incised outlines, cut 3 to 5 cm. deep into the rock, which are even earlier than the oldest outlines in black found in the recess. Advantage was frequently taken of the irregularities of the walls to give an effect of relief to

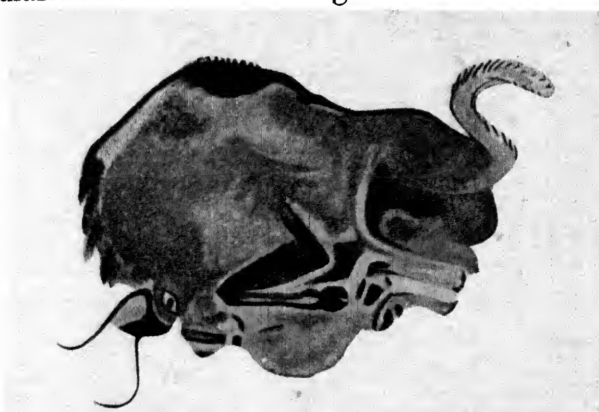

FIG. 189.—Polychrome painting of a bison, partly modelled by the relief of the wall (Magdalenian). (After Cartailhac and Breuil, *L'Anthr.*)

the whole figure, and particular prominence to some of its parts. It must be confessed, however, that the results are more ingenious than pleasing. The natural pose of the animal gives place to constrained and violent attitudes (Fig. 189).

The colours employed were red, brown, black, and several shades of yellow, graduated into numberless half-tones and tints. They were obtained from mineral substances such as iron ochre and oxide of manganese, which were prepared for use by grinding them down to a fine powder. The pigment was carried in little horn-like cases, made from the cannon-bone of a reindeer and adorned by transverse lines or rows of criss-

cross, scored on the exterior. Such "paint tubes," one still containing ochre, have been found among the débris of Aurignacian deposits (Fig. 190). The pigment was also made up into crayons. The sides of these are scored by transverse lines, which are perhaps the maker's mark (Fig. 191). The actual painting was probably

FIG. 190.—"Paint-tube" from La Grotte des Cottés. (After Breuil. × ⅜ about.)

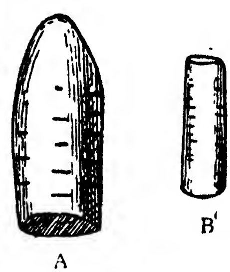

FIG. 191.—Crayons of red ochre in M. Didon's collection from l'abri Blanchard, Dordogne. (Nat. size.)

done with a brush. The Bushmen, whose art is so remarkably similar, are said to have made paint brushes with hairs taken out of the tail or mane of a gnu.[1]

[1] W. E. Stanford, Statement of Silayi (a Jumbo of the Jumba tribe) with reference to his life among the Bushmen. *Trans. Roy. Soc. S. Africa*, 1908-10, vol. i, p. 439.

M. Cartailhac and the Abbé Breuil speak in enthusiastic terms of the group of polychrome figures shown in outline in Fig. 183; they characterise it as "l'œuvre la plus parfaite que nous puissions actuellement citer de ces époques reculées, et qui place les vieux peintres des âges glyptiques bien au-dessus des animaliers de toutes les civilisations de l'orient classique et de la Grèce: rien n'égale la rigueur du trace, l'exactitude et la hardiesse des attitudes, l'habileté et le fondu des nuances rouges, brunes, noires, et jaunes qui se mélangent et se graduent en mille demi-teintes."

This eulogy will surprise no one who has actually seen these precursors of Velasquez' art. Their strength and truth and beauty are only equalled by the marvellous knowledge of technique which they display.[1]

It will be noticed that the animals are irregularly scattered; they are full of character and life, but they tell no story. The greater number are bisons; standing, walking, rampant, they crowd the middle of the picture; on the extreme left is a deer, shown on a larger scale in Fig. 186; above it to the right is a wild boar, one of the animals most dreaded by primitive hunters; next to this is a mare with her colt; on the extreme right is another wild boar, apparently in the act of charging.

A remarkable similarity in general style and motive characterises the Magdalenian art of all the painted caves, so that Altamira might almost serve as an epitome of the rest; it will only be necessary, therefore, to refer to a few other instances, and I shall restrict myself to those caves which I had the privilege of visiting under the guidance of my friends, Messrs. Cartailhac, Breuil, and Peyrony. One of these is the Font-de-Gaume,

[1] I was personally introduced to Altamira by my friend Prof. Boule, to whom I now venture to express my thanks for one of the great pleasures of my life.

which opens into the picturesque valley of the Beaune, about a mile from Les Eyzies. It contains many excellent paintings, both isolated and in groups, though nothing comparable with the astonishing works which adorn the roof in Altamira. The bison is most frequently represented, but there are also horses, antelopes, reindeer, and mammoths. Some are of life-size—one noble figure of a bison measures 9 feet in length—others are smaller, the least attains a length of only 2 feet.

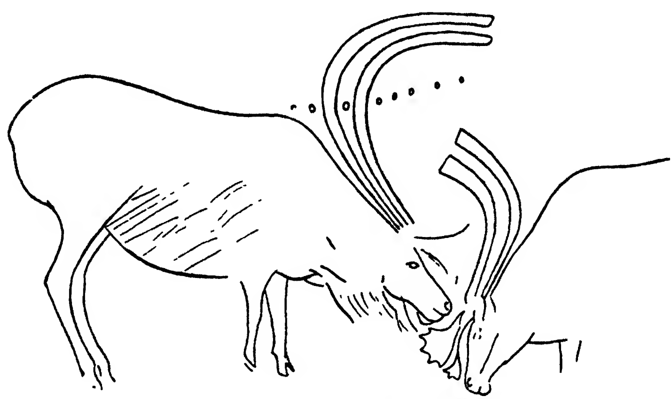

FIG. 192.—Outline drawing of a painting of two reindeer fronting each other, from Font-de-Gaume, Dordogne (Magdalenian). (After Capitan and Breuil.)

The picture of two reindeer fronting each other, shown here in outline (Fig. 192), is produced by a combination of engraving and painting.

Unfortunately for the title of this chapter most of the paintings we have just described, although first in the order of discovery, are by no means first in the order of age. They are not the maiden efforts of the Aurignacians, but the finished masterpieces of the latest Magdalenians.

Now, however, that we have wandered so far out of our path it will be more convenient to proceed, and we

will complete at once what we have to say on the mural art in its later stages before passing to its earlier development by the Aurignacians.

If Altamira claims the first place for its paintings, Niaux, to which we now turn, is no less distinguished for its sketches in black and white. The cave is situated in one of the valleys of the Pyrenees, not far from Tarascon-sur-Ariège (another Tarascon, not Tartarin's); it runs as a long gallery for almost a mile into the mountains. The sketches on its walls, drawn with a bold, sure hand, represent the usual animals, horses, deer, wild goats, and, in greatest abundance, the bison. In truth of form, clearness of line, and the vigorous rendering of life-like attitudes they remain unsurpassed. Here, where we have the effect of pure form without the overpowering aid of colour, we can better appreciate the draughtsman's skill, and we shall esteem this the more when we consider the conditions under which he worked. A cave is not as comfortable a place as an artist would choose for the exercise of his art; its walls by their irregularity often compel him to adopt an awkward attitude ill-suited to his purpose; it is dark, and the artificial illumination of the time was scarcely adequate. Evidently the use of models was precluded; the animals which the artist delineated were not before his eyes, and the presumption is that they were drawn entirely from memory.

In Niaux, as in Altamira, the projections of the wall have sometimes suggested the likeness of an animal form, and the artist has then assisted nature by completing the sketch. One instance, more successful than some, is shown in Fig. 193. A swelling of the wall has given the outline of the back of a bison, the artist has done the rest. A black dot on the flank is meant

probably for a wound, and, as Messrs. Cartailhac and Breuil suggest, the falling fore-limbs seem to suggest

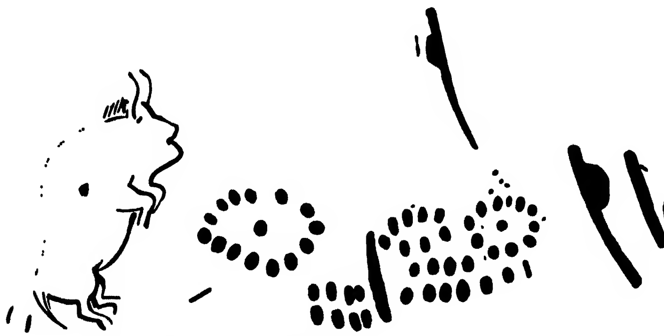

Fig. 193.—Supposed pictographic inscription in red; the back of the bison (dotted line) is formed by a ridge on the wall (Magdalenian). (After Cartailhac and Breuil, *L'Anthr.*)

that the consequences are serious. The objects facing the bison are supposed by the same distinguished observers to be boomerangs. They are not unlike the Australian li-lil (Fig. 132, p. 268), but the prolongation of the shaft beyond the head gives them a still greater resemblance to some forms of stone-axe. That the axe is sometimes used as a missile is well known. An implement of almost precisely similar outline (Fig. 194) has been described from one of the Indian mounds of Arizona; it consists of a stone blade cemented by rosin into a wooden handle.[1] The rows of

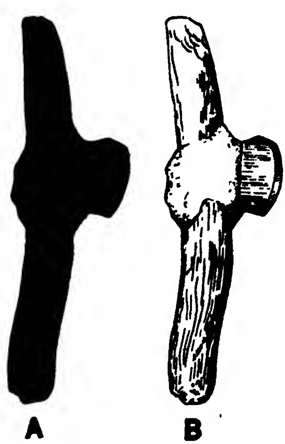

Fig. 194.—Implement from Indian mound, Arizona. (After Fewkes.)

[1] J. W. Fewkes, "Archæological Exploration to Arizona in 1895," *Rep. Bureau American Ethnology*, xvii, p. 571.

dots are difficult to interpret, but similar marks are to be found in caves painted by the Australians (Fig. 190) and by the Bushmen of South Africa (Fig. 199).

In some cases the bison is represented with arrows marked upon his flank (Fig. 195); singularly enough, some of them are painted in red, a colour not used in

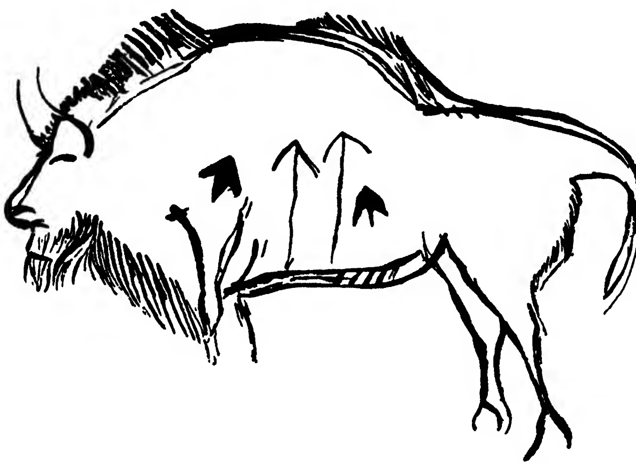

FIG. 195.—Bison with four arrows on the flank, one on each side in red, from the Salon noir de Niaux (Magdalenian). (After Cartailhac and Breuil, *L'Anthr.*)

these instances for the outlines of the animals, and suggestive of blood and wounds.

Some drawings, as sharp as when they were first traced, are to be seen in the fine sand which forms part of the floor of the cave; one is a telling sketch of a wounded bison, and there are two trout (Fig. 196) just like those now living in the Ariège; not far from them is the imprint of the naked foot of a man, left perhaps by the artist himself. It is astonishing that drawings in such a fugitive material should have outlasted the revolutions of so many thousands of years, but the sand

is damp and not a breath of wind disturbs the stagnant air of the cave; so still is it that the smoke of a single cigarette will perfume the cave for many days. Similar drawings of fish are made in sand at the present day on the banks of rivers in Central Brazil; one, representing

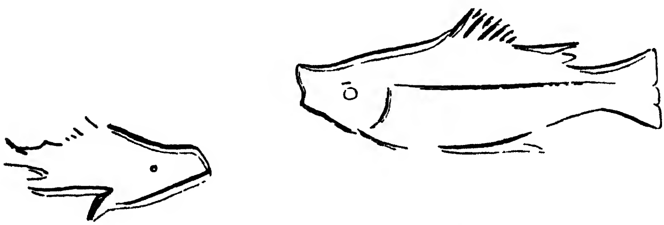

FIG. 196.—Outlines of two trout, traced in the sand on the floor of Niaux (Magdalenian). (After Cartailhac and Breuil, *L'Anthr.*)

a kind called "matrincham" by the natives, was found at a spot where good fishing for matrincham is to be had (Fig. 197).[1]

One of the most remarkable collections of engravings is to be seen in the Grotte des Combarelles, situated not far from Font-de-Gaume. The cave is a long narrow gallery, only just wide enough to afford comfortable walking to one person at a time, and less than 6 feet in height. The engravings, which are deeply cut, begin in complete darkness about midway down its length, more than 100 metres from the entrance, and extend in almost uninterrupted succession along both sides of the passage for a distance of 100 metres. Isolated examples,

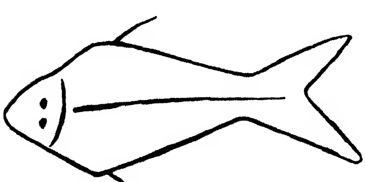

FIG. 197.—Recent tracing of a fish (the matrincham) made in the sand by the natives of Central Brazil. (After von den Steinen.)

[1] Karl von den Steinen, *Unter den Naturvölkern Zentral-Brasiliens*, Berlin, 1894, pp. 570, in particular p. 248.

reproduced on a small scale, can afford no notion of the effect produced by these life-like figures as they follow one close upon another, crowding the walls in a fashion which recalls the paintings in an Egyptian tomb. If the pageant is apt after a time to grow a trifle monotonous it remains none the less impressive.

Among the various animals which here play their part are numerous mammoths (no fewer than fourteen); depicted, as Messrs. Capitan and Breuil remark, with astonishing exactitude; some are full grown, others

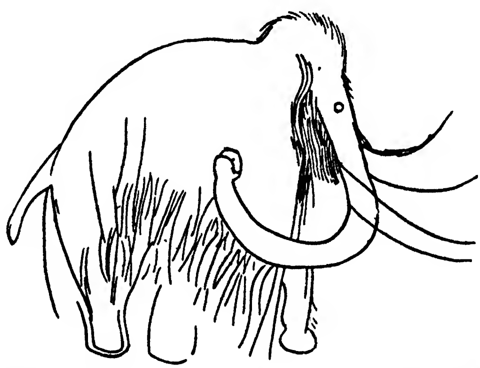

FIG. 198.—Engraving of a mammoth, Les Combarelles (Magdalenian). (After Capitan and Breuil. × $\frac{1}{18}$.)

very young, looking like balls of fur. The spirited study of one of the adults shown in Fig. 198 gives a vivid idea of the living mammoth, and has an air of greater reality than the carefully stuffed specimen of an actual mammoth preserved in the Museum at Petrograd; yet, if for the sake of comparison we turn to another example of primitive art, the sculpture of an African elephant (Fig. 257) which we owe to the Bushmen, we shall be impressed less with the vigour than the crudity of the more ancient example.

The figure of a horse (Fig. 199) is a remarkably

faithful drawing; the rendering of the savage-looking head is alone sufficient to place it in the first rank.

So far we have confined our attention to the art of the Magdalenians, but even in Altamira itself there are many paintings and engravings of a more ancient date. At a very early period in the investigation of this cave it was observed that the various figures often overlie one another to a greater or less extent, and from a study of the order in which they are superposed it

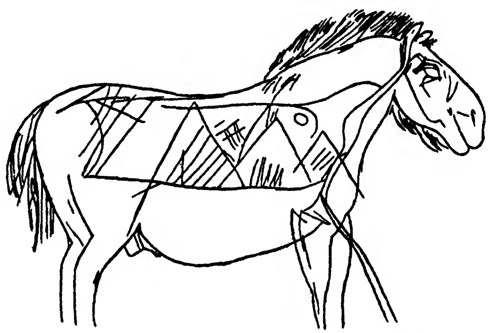

FIG. 199.—Engraving of a horse, Les Combarelles (Magdalenian). (After Capitan and Breuil. × 1/16.)

was found possible to arrange them in a series and thus to establish the order of their age *inter se.*

This, however, afforded no clue to their position in the Palæolithic series; whether, that is, they are to be assigned to the Aurignacian or Solutrean or Magdalenian, or some to one, some to another age. On this point the first definite information was afforded by the cave of Le Pair-non-Pair (Gironde),[1] where incised drawings on the walls were found to be covered up to a considerable height, about halfway, by cave deposits, which, though originally regarded as Magdalenian, are now known to be of much earlier date. They contain

[1] F. Daleau, "Les gravures sur rocher de la caverne de Pair-non-Pair," *L'Anthropologie*, 1898, ix.

an Upper Aurignacian industry, and rest as at Brassempouy on the Lower Aurignacian with its sculptured ivory.

As the engravings are partly concealed by these deposits they must be anterior to them, or older than the Upper Aurignacian. In all probability they belong to the middle stage when the Aurignacian technique in all kinds of workmanship had attained its highest perfection.

The Aurignacian is a downward limit. The upward limit remained for long unascertained, and, originally,

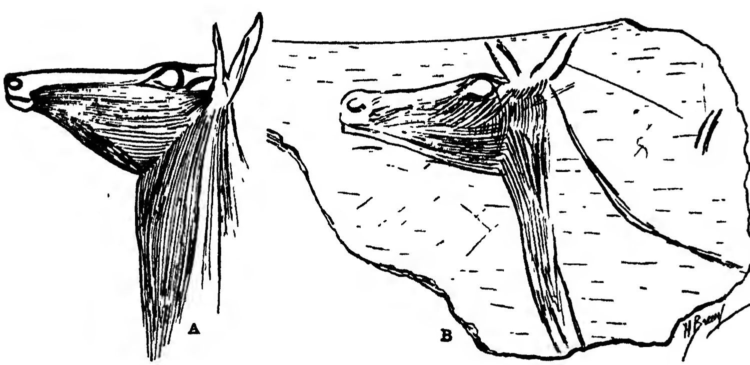

FIG. 200.—A, deer's head drawn on the wall of Altamira; B, similar head on the shoulder blade of a deer found in the Lower Magdalenian deposits of the cave. (After del Rio and Breuil.)

while pointing this out and insisting on the need for caution, I was inclined, in default of data, to attribute all the mural art to an age in which some examples were certainly known to occur, rather than to extend its range further than the facts seemed to warrant.

Recent discoveries, however, have supplied the necessary data.[1] The Lower Magdalenian deposits of Altamira have yielded, engraved upon the shoulder blade of a deer, the profile of a deer's head (Fig. 200 B), and

[1] A. del Rio, H. Breuil and L. Sierra, *Les Cavernes de la Région Cantabrique*, Monaco, 1911, cap. xv.

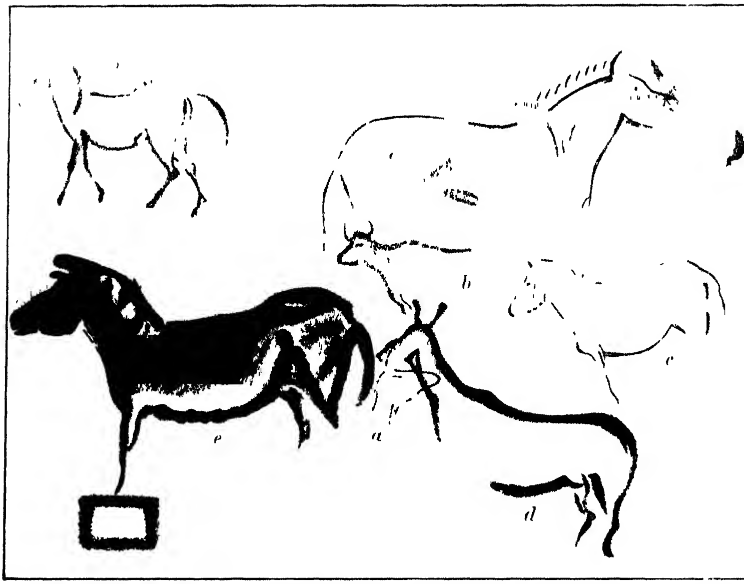

FIG. 201.—Superposed paintings from La Pasiega, Santander. *a*, deer, Lower Aurignacian (in red); *b*, *b*, horse and some kind of ox, Upper Aurignacian (in red); *c*, *c*, horses, Lower Magdalenian (in black); *d*, deer, Magdalenian (in red); *e*, horse, Upper Magdalenian (in red, with part of the outline of the head in black, an early stage of polychrome). (After Breuil.)

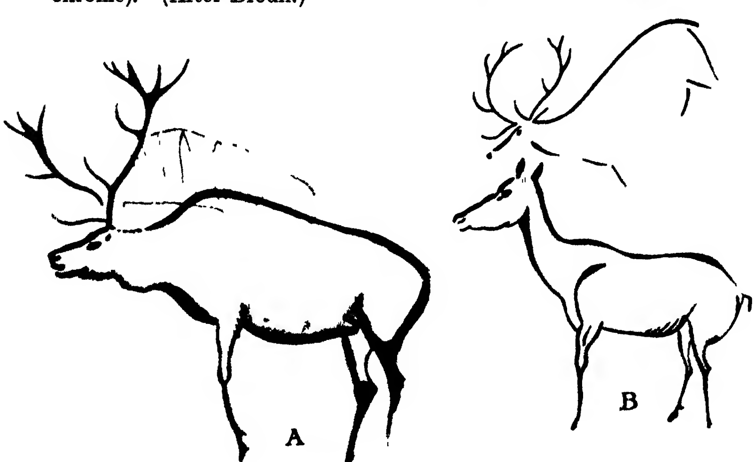

FIG. 202.—Stag, A, and deer, B, painted in red; from La Pasiega, Upper Aurignacian. Above B is the outline of another stag belonging to an older series (Lower Aurignacian). (After Breuil. A × about $\frac{1}{20}$, B × about $\frac{1}{15}$.)

a similar head portrayed in precisely the same style is to be seen upon the wall (Fig. 200 A). The correspondence in technique and in every other respect is so close that we might well suppose the two drawings to be the work of the same hand.[1] If the drawing on the bone is Lower Magdalenian, and of this there can be no question, then that on the wall must assuredly be Lower Magdalenian also. Precisely similar evidence is afforded by the cave of Castillo in Santander.

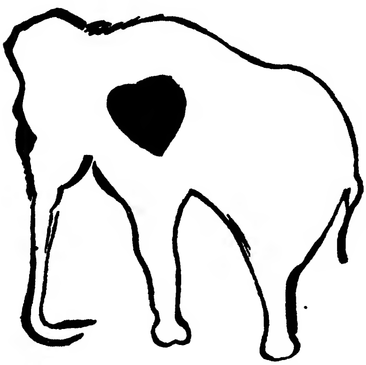

FIG. 203.—Outline of Elephant in red, from the Aurignacian of Pindal. (After Breuil. × about $\frac{1}{9}$.)

Again in Altamira this Lower Magdalenian sketch, and others like it, are partly covered over by the poly-

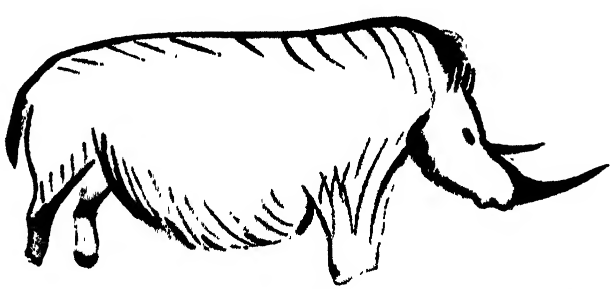

FIG. 204.—Woolly rhinoceros, painted in red, from the Aurignacian of Font-de-Gaume. (After Breuil. × about $\frac{1}{8}$.)

chromes, which are thus of still later date, probably Upper Magdalenian.

The manner in which Aurignacian and Magdalenian

[1] May it not be that these sketches on bone were used to assist the memory when making drawings on the wall?

paintings are scattered together on the walls is shown in the example given above (Fig. 201), which is from the cave of La Pasiega (Santander). The earliest outline, the head of a deer (*a*), is seen to be covered by the much later one (*d*); the horse (*b*) and the ox (*b*) are both of the same age and Aurignacian, and the ox (*b*) is covered by *d*, as well as by the two horses (*c*, *c*), which are early Magdalenian.

The Aurignacian figures are seldom much more than outline drawing, but they are often distinguished by great truth and vigour; the stag from La Pasiega (Fig. 202 A) is an excellent example of its kind: by a naïve convention the antlers are turned out of their true position to show both the brow tynes in full. From the cave of Pindal (Asturias) we have a bold and simple sketch of an elephant (Fig. 203) showing the legs of only one side; over its shoulder its heart is represented in the generalised form which is still the recognised symbol. We shall refer to this again.

From Font-de-Gaume (Dordogne) we have amongst others the outline drawing of a deer in black, and of a rhinoceros (Fig. 204) in red, which may be compared with Mr. Knight's sketch (Fig. 93 on p. 200).

A later discovery by Dr. Mayet [1] has provided us with another and more complete sketch of the woolly rhinoceros, which includes even the feet. This is from an Aurignacian horizon in the rock shelter of Colombière (Ain). It is scratched upon the smooth surface of a flat limestone pebble.

Of engraved figures, Hornos de la Peña (Santander) has furnished some good examples, such as the horses of Fig. 205, which mark the beginning of the Aurignacian

[1] L. Mayet and Jean Pissot, "La Colombière," *Annales de l'Université de Lyon*, ser. 1, vol. 39. 1915, pp. 193, 25 pls. and many figures in the text.

and those of Fig. 206 *a*, which mark its close; the stag (Fig. 207 *b*) which is upper Aurignacian; the bulls' heads (Fig. 207) one (*a*) from the beginning and the other (*c*)

FIG. 205. Incised drawings of horses from the Lower Aurignacian of Hornos de la Peña. (After Breuil. × nearly $\frac{1}{8}$.)

from the end of the period, and finally the bison (Fig. 206 *c*) which is late Aurignacian. The faithful and vigorous sketches of the Abbé Breuil give a much better

idea of these designs than any photograph. Owing to the difficulties of illumination photographs are usually

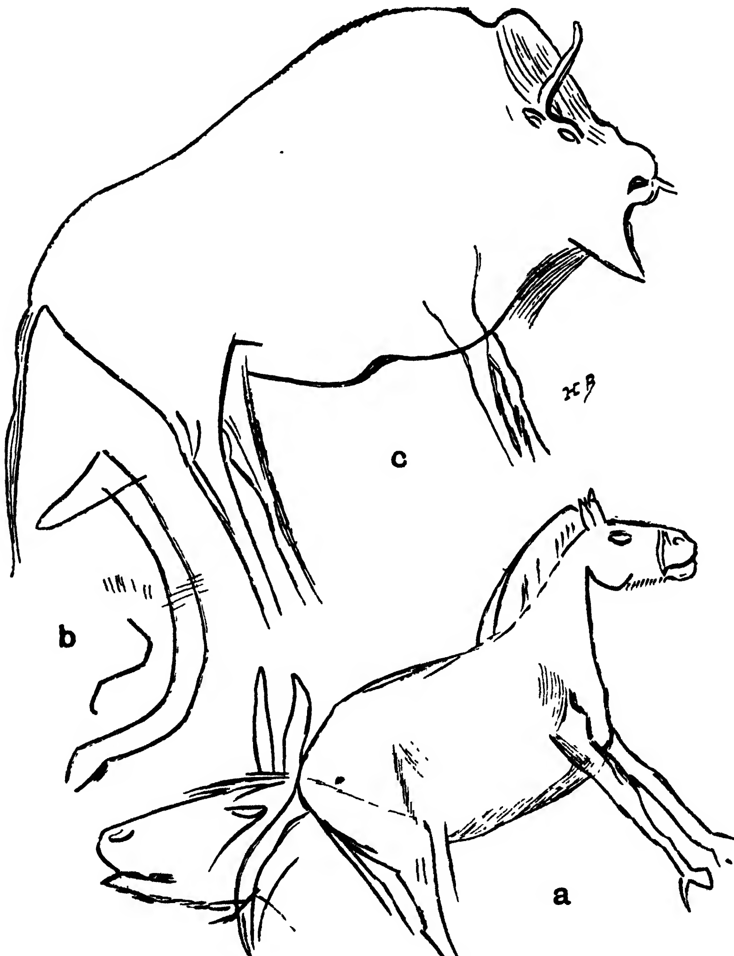

Fig. 206.—(? Lower Solutrean) Engravings from the Upper Aurignacian of Hornos de la Peña. *a*, Horses (× about ⅛); *b*, unintelligible sign (a serpent?); *c*, bison (× nearly ⅐). (After Breuil.)

unsuccessful, but we give here a single example (Fig. 208) for comparison.

We have already alluded to figures drawn in the clay on the floor of Niaux; from these we may pass to modelling in the round, as shown by the famous bisons of the Tuc d'Audoubert (Ariège).

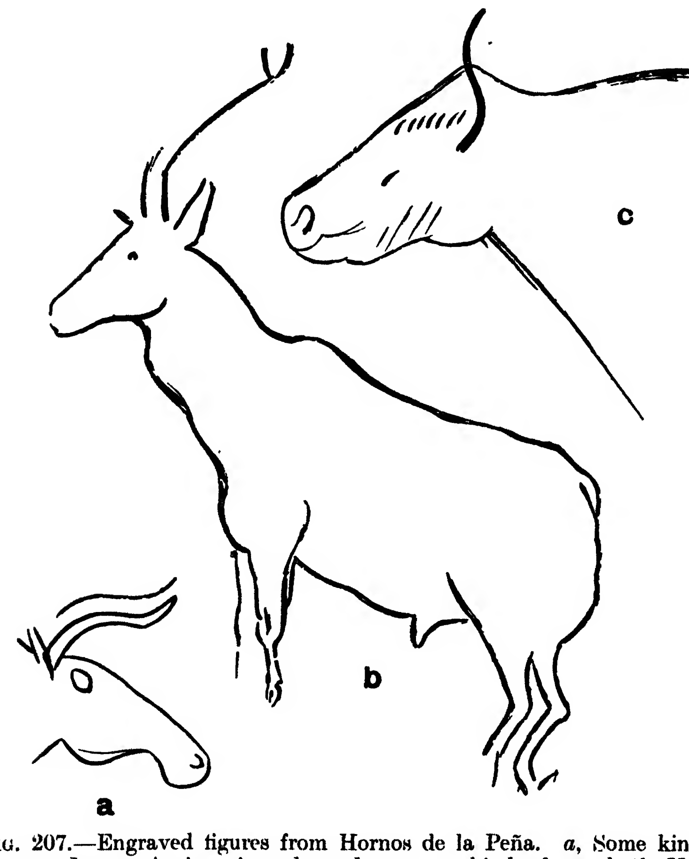

FIG. 207.—Engraved figures from Hornos de la Peña. *a*, Some kind of ox, Lower Aurignacian; *b*, a deer; *c*, a kind of ox, both Upper Aurignacian. (After Breuil.)

We owe our knowledge of this cave to its courageous exploration by Count Bégouen and his three sons.[1] It is

[1] Le Comte Bégouen, "Les statues d'argile de la caverne des Tuc d'Audoubert (Ariège)," *L'Anthropologie*, 1912, xxiii, pp. 657–665, and *C. R. des séances de l'Ac. des Inscriptions et Belles Lettres*, 1912, p. 532, pls.

very complicated and difficult of access; entering it, an adventurous journey leads through winding ways, diversified by steep ascents and narrow passages, sometimes constricted into little tunnels, "chatières," through which one can only pass by wriggling like a snake, "ventre à terre"; on the walls of the chambers are

FIG. 208.—Photograph of a horse deeply incised on the wall of Hornos de la Peña. Fig. 206 *a* is a sketch of this engraving. (After Breuil.)

numerous paintings and incised drawings representing the animal life of the time; here and there are preserved the marks of the cave-bear's claws, deeply scored in banks of clay or scratched upon the stalagmite; occasionally we see, looking at us, his great skull lying bleached upon the floor.

On the floor of one chamber we also observe imprints in the clay of human feet, apparently as fresh as when they were made. They are small and delicate and seem

to indicate a little people of short stature, thus recalling the Bushmen, the smallness and fineness of whose hands and feet have attracted the attention of more than one observer. Further on in another chamber we again meet with footprints, this time showing only the heels deeply dug into the clay. This is a curious fact and difficult to account for; the roof of this chamber is low, but a stooping posture does not throw the weight on the heels; it is much easier to walk on the heels when the body is only slightly inclined than when it is much bent. Some sinuous tracks suggestive of a gliding movement occur with the footprints and have been supposed to point to some kind of dance and religious ritual.

At length we arrive at the Salle de Cartailhac, an antechamber to the arcana beyond prepared by Nature herself. We linger awhile to admire its beauty. It is adorned in chastest splendour with white stalactite, which lines the walls, depends from the roof in myriads of pointed spears, threads the air in a maze of slender columns and spreads upon the floor in a lacework of little basins filled with silent pools of water. We pass on and soon enter the magician's chamber—chapel—workshop—what you will—and there leaning against a mound in the middle are the creatures of his art (Fig. 209). Two bisons modelled to the life, one a bull, 63 cm. in length by 31 cm. in height measured from the belly to the chine, the other a cow, smaller by 2 cm. Only one side is completely modelled, the other, which rests against the rock, is left in the rough.

The treatment is broad and simple, yet with sufficient appreciation of anatomical detail to produce an admirably realistic effect.

The surface is smooth but retains traces of the artist's

hand; the horns and ears are well detached; the fine hair of the beard has been put in with a sharply pointed implement, the coarser mane with the thumb.

There is nothing tentative in this work; the artist shows complete power over his material, and, as in all this Palæolithic art, we are impressed by its complete freedom from stiffness. It is probably 20,000 years old and yet quite modern.

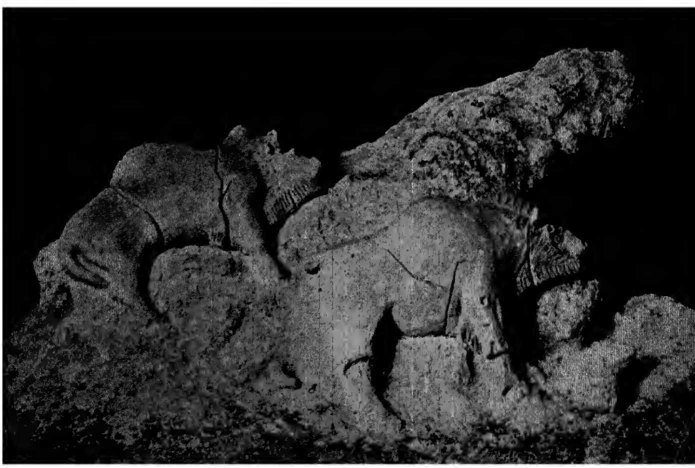

Fig. 209.—Two bisons, modelled in clay, from the cavern of the Tuc d'Audoubert, Aurignacian. (Photographed by Count Bégouen from a replica in clay.)

That the bisons, like Aaron's golden calf, were connected with some religious cult, is no doubt true, yet it is possible that the artist himself was more concerned with the means than the end. For ourselves, as we gaze upon this work in reverence and sympathy, we are impressed more with the artist than the priest.

The figures of two other bisons are deeply incised in the layer of clay which covers the floor, so that it would seem as if the artist began his work with silhouettes, such as these, which were afterwards lifted out and

completed by modelling. Thus the models appear to be a further development of such drawings as occur on the floor of Niaux.

Not far from Tuc d'Audoubert, and perhaps communicating with it, is the cavern of Les Trois Frères, named after the three sons of Count Bégouen, who in 1914 added this to their previous triumph.

Like Tuc d'Audoubert it is a great picture gallery with designs, however, which introduce us to a new technique, though we perceive perhaps its first symptoms in Altamira. The walls are covered with a thin brown coating not well adapted to sketches in black outline, and consequently a sort of superficial intaglio method is adopted, *i.e.* the brown layer is scraped away to reveal the white rock below and a white drawing is thus obtained on a dark ground.

The centre of interest here, however, is to be found at the end of the Salle du Sorcier.[1] High up on the wall close to the roof is the mysterious figure named the Sorcerer. To examine it closely one must climb a little, and then holding on with both hands and a foot swing round over an abyss on to a little ledge where one can sit down and examine the figure face to face. The artist must evidently have been provided with some sort of scaffolding.

The faithful sketch by Prof. Breuil is reproduced in Fig. 210. It presents a remarkable combination of the horns of a stag, a face like an owl's, a long beard, the ears of a wolf, the tail of a horse, the paws of a bear and the feet of a man. The body and thighs are striped, probably to represent the pelt of some animal. It seems to symbolise in one person fleetness, wisdom, penetrating vision, and strength. Whether these attributes were

[1] Comte Bégouen, "Un dessin relevé dans la caverne des Trois Frères," *C. R. des séances de l'Ac. des Inscriptions et Belles Lettres*, 1920, p. 303.

attributed to the wizard himself or to some mythical being it is impossible to say. Miss M. A. Murray,[1] author of a remarkable book on witchcraft, suggests a comparison with the chief wizard in a witches' community,

Fig. 210.—The Sorcerer of the cavern des Trois Frères.

who, disguised in an animal's skin, a mask with a long beard, and a tail, functioned as the witch-god at the celebration of the witches' Sabbath.[2] Mr. Burkitt is reminded of the horned god of the Gauls, Cernunnos, the Celtic Dys, and Herne the Hunter.[3]

An essentially similar but less disguised figure is cited

[1] Miss M. A. Murray, *The Witch Cult in Central Europe*, Oxford, 1921.
[2] *Ibid.*, *Man*, vol. xxii, 1922, No. 2.
[3] M. C. Burkitt, *Man*, vol. xxi, 1921, No. 108.

by Count Bégouen as engraved on a piece of schist found at Lourdes and now preserved in the Museum of St. Germain (Fig. 211). It represents a bearded man with a horse's tail and lines above the head which are supposed to be meant for horns.

The "Sorcerer" is not the only monstrous combination of this age. Both in the cave of Les Trois Frères and the Tuc d'Audoubert we discover among the crowd of normal animal forms which embellish their walls some fantastic creations which anticipate in a manner the "gorgons, hydras and chimæras dire" of Greek mythology. Such are a lion with three heads, two of them facing the observer and the third turned aside in profile, a sort of lion Cerberus; a bear spotted like a leopard, another with the head of a wolf, and still another with the tail of a bull; and finally horses, some with two tails, and others with more than four legs. These are some out of the many instances which show how deeply the mind of Palæolithic man was steeped in symbolism: "Tout dans cette caverne nous parle de magie."

Fig. 211.—Sorcerer from Lourdes. (After Count Bégouen.)

The portrait we should most welcome is not to be found in any of the caves of Northern Aurignacia, for the man of the period has not depicted himself with that close attention to detail which distinguishes his studies of the lower animals.

Of such poor attempts as have yet been discovered

there is not a score in all. La Colombière [1] has recently added another to the list (Fig. 212). This is distinguished

FIG. 212.—Outline engraving of a woman and recumbent figure of a man from the cavern of La Colombière. (After Mayet and Pissot.)

by unusually graceful outlines which recall the ivory statuette, known as the Venus innominata of Brassempouy (Fig. 243 B) it is engraved on mammoth bone of Aurignacian age.

[1] L. Mayet and J. Pissot, *op. cit.*

There are some grotesques (Fig. 213) which seem to be meaningless, like the foolish caricatures on a school-

FIG. 213.—Sketches of the human face, from the cave at Marsoulas (Magdalenian). (After Breuil, *L'Anthr.*)

boy's slate; possibly they are intended for demons, which the Babylonians are said to have made as unprepossessing as possible in order that they might be

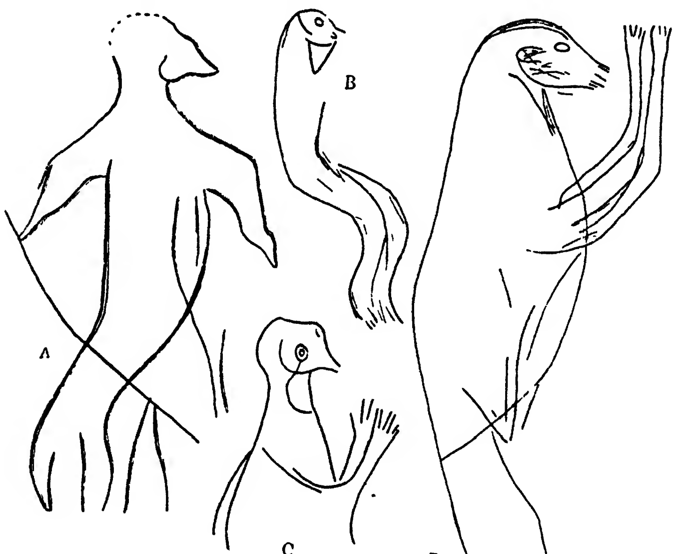

FIG. 214.—Monstrous forms, engraved, from Altamira (Aurignacian). (After Cartailhac and Breuil, *L'Anthr.* Much reduced.)

frightened at their own image. Some singular beings (Fig. 214) are also represented, which have been variously interpreted, sometimes as anthropomorphous apes,[1]

[1] Piette.

sometimes as Neandertal men, and again as Aurignacians disguised in masks such as are worn by many primitive people when engaged in religious dances.

In their apparent neglect of the human form the ancient artists have been compared to the Ainos of Japan, who decorate certain rods—used to lift the moustache when drinking—with figures of birds, mammals, and fish, but never of men; and when asked the reason for this they assert that they do not know how to represent the human form.

FIG. 215.—Three figures of women from the group at Cogul. Oblique lines represent red. (After Breuil and Cabré, *L'Anthr.*)

When, however, we leave the North and enter the Southern or Mediterranean province the scene suddenly changes, a different fauna is represented on the walls and human figures engaged in many interesting occupations greet our eyes. The first to be discovered (and these are Magdalenian) occur on the face of a rock shelter at Cogul, near Lerida in Spain (see Map, p. 351, and Fig. 215).

In one of them a number of women seem to be engaged in some kind of dance; they are shown in various attitudes circling round the crudely drawn figure of a little naked man. Some of these women are shown in the illustration (Fig. 215). In another there are two similar female figures; the cattle in the foreground of the picture (Fig. 216) have an air of domesticity and the women seem to be driving them home; but a wilder animal is seen in the distance, apparently in the act of charging a man who has unsuccessfully discharged his

spear, which is falling behind the intended victim. The women in all the drawings are clothed in a gown cut short near the knees and apparently puffed out about the elbows.

The waists are wasp-like, an exaggeration on the part of the artist which suggests that tastes have little changed, and the dress though very old-fashioned—the

FIG. 216.—A hunting scene from Cogul. (After Breuil and Cabré, *L'Anthr.*)

oldest Spanish fashion on record—would seem to be coming in again.

None of the figures are sufficiently detailed to show any distinctive racial features; there is, however, no apparent steatopygy (p. 438), but the breasts are very long and pendent, as they are in many existing primitive peoples.

A later discovery is that of Alpera [1] in Southern

[1] H. Breuil, P. Serrano Gomez, and J. Cabré Aguilo, "Les Abris del Bosque à Alpéra (Albacete)," *L'Anthropologie*, 1912, xxiii, pp. 529–562, pl.

FIG. 217.—Part of the frieze at Alpera, Southern Spain. The oblique striation indicates red colouring. (After Breuil.)

Spain, where the wall of a rock shelter at the foot of a Cretaceous escarpment, has been painted in a frieze over 10 metres long and 2·5 metres in height. Among the animals depicted are goats, ibex, stags, fallow deer, oxen, horses, wolves, and an eland. A troop of wild

FIG. 218.—Hunters from the frieze of Alpera. (After Breuil.)

Spanish goats is seen crossing the field in characteristic attitudes (Fig. 217). Some of the paintings have evidently been restored by a later hand, with the unfortunate results that usually attend this deplorable art.

Of human figures there are no less than seventy; most of them are little people painted in black. Some are

drawing the bow, some shooting (Fig. 218); one fine fellow is swaggering along in a jaunty fashion with his bow and arrows under his arm (none of them have quivers); a puck-like creature with a tail seems to be teasing a cow (on the right of Fig. 217), and a very diminutive man is climbing something which looks like a rope (in the middle of Fig. 217). Evidently there is a good deal of fantasy in some of these pictures.

Some of the men wear a sort of biretta, which in several cases is horned; below the knee is something which suggests the ragged ends of a pair of brogues, but it may also be interpreted as some kind of amulet; a swelling round the ankles, like stockings that have come down, may represent anklets.

In addition to the little people there are three great men, one of them painted in red, the others in black. They are distinguished by a different kind of head-dress resembling the crest of feathers worn by some Red Indian tribes. The profile of the face is visible in two of these men; it is distinguished by an aquiline nose. It has been suggested that these men are magicians or medicine men drawn large to magnify their office, but it is possible that they represent a different race. This would be consistent with their extremely disproportionate size, for it has often been observed, since it was first pointed out by Nilsson, that when a people of a country live in contact with others of larger stature they are very apt—thinking of themselves as normal—to exaggerate the dimensions of their neighbours and to represent them as giants, whence our Jack-the-Giant-Killer stories; while when their neighbours are shorter than themselves they represent them as dwarfs, whence our fairy stories.

Two women are present, not unlike those of Cogul,

FIG. 219.—A group of fighting men advancing against an enemy, extracted from the frieze of Minateda, Albacete, Spain. (After Breuil. × ⅕ about.)

but wearing longer petticoats, which come down to their ankles.

We shall encounter later evidence of the contempor-

aneous existence of two distinct races in Europe during the Aurignacian age, and with this may be connected the fact that man had already learnt to turn his weapons against his fellows. In the accompanying figure (Fig. 219) the actors in one desperate combat are seen advancing in an attack: one of them in the rear appears to be already stuck full of arrows and at the point of collapse.

An obvious difference which distinguishes this art of the South, practised in the open air, from that of the North is that no attempt is made at the faithful and elaborate portraiture of isolated individuals; the artist is content to indicate his subject by generalised figures, taking care, however, to embody their most distinctive characters.

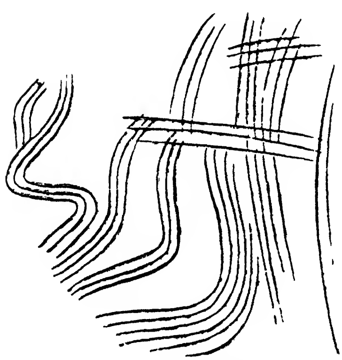

FIG. 220. — Interlacing lines scratched in the clay of Hornos de la Peña in the Cantabrian mountains. (After Cartailhac and Breuil, *L'Anthr.* $\times \frac{1}{10}$.)

This simplification attends and possibly results from a change of motive. What appears to be aimed at now is a representation of activity, often of some scene full of movement. We shall meet among the Bushmen with precisely these two different classes of art.

Returning now to the painted caves we find in addition to pictures of living forms, curious markings and signs, few of which we are as yet able to interpret. Among the earliest, dating from the very beginning of the Aurignacian, are groups of long meandering and interlacing lines or furrows "macaroni," often made by dragging the fingers over a surface of clay. They are

well displayed at Altamira, Gargas, and Hornos de la Peña (Fig. 220).

A little later but still in the Aurignacian age, we encounter a number of enigmatical signs; groups of disc-like dots, sometimes arranged like stars in a constellation (Fig. 221 *k*, *l*, *m*) are not infrequent: similar markings are also met with in the paintings of some modern hunting races, and in some cases are known to represent a tally score. The Bushmen of South Africa

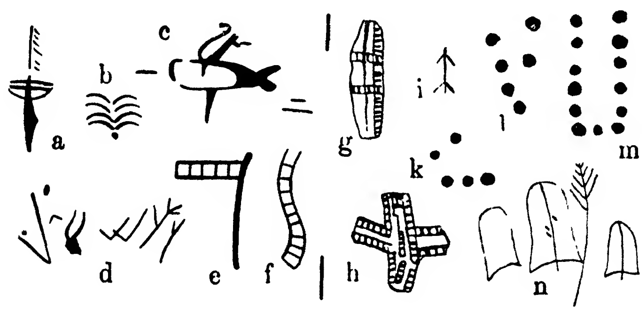

FIG. 221.—Enigmatical signs. *a*—*f*, from Altamira (after Cartailhac and Breuil, *L'Anthr.*; *g*—*n*, from Hornos de la Peña (after Hermilio Alcalde del Rio); *a*, *b*, *k*, *l*, *m*, *n* are Aurignacian, the rest are Magdalenian. (All very much reduced.)

or the aborigines of Australia could have thrown some light on these marks, but this opportunity has now been lost. Branching rods and forms which are known as "scutiform" (Fig. 221 *n*) also occur, as well as others equally or more unintelligible (Fig. 221 *a*, *b*).

Still later, in the Magdalenian, fresh symbols make their appearance, such as those shown in the illustration (Fig. 221 *c* to *i*) and others which will be referred to later. The figure 221 *i* is an almost universal symbol for a man.

There is, however, one class of signs of Aurignacian as well as of later date which must be discussed here at greater length.

Allusion has already been made to the practice of amputating the little finger which prevails among the native women in some parts of Australia (p. 277), a custom which is widely spread among primitive people in all parts of the world.

That it existed among the Bushmen of South Africa was observed by Burchell as early as 1812. He writes: "I met one old woman who . . . . stopped to show me her hands, and bade me observe that the little finger of the right hand had lost two joints and that of the left, one. She explained . . . that they had been cut off at different times to express grief . . . for the death of three daughters. After this I looked more attentively at those I met, and saw many other women, and some of the men with their hands mutilated in the same manner; but it was only the little fingers which were thus shortened."[1] Stow[2] adds that the custom was almost universal among this people, as well as among the old Tambukis; speaking of one party of Bushmen that he met, he remarks: "they had all lost the first [last] joint of the little finger."[3] The operation was performed with a stone knife. Its object, according to Stow, was to ensure a long career of feasting after death or a safe passage to the next world, but Arbousset states that in some tribes it was a mark of distinction or caste.[4] Patterson[5] met with the custom among the Hottentots of the Orange River, who cut off the last joint of the little finger as a cure for sickness, but the remedy was only applied to young people. Schmidt[6] records it as

[1] W. J. Burchell, *Travels in the Interior of Southern Africa*, ii, p. 61, 1824.
[2] G. W. Stow, *The Native Races of South Africa*, London, 1905, p. 129.
[3] Stow, *op. cit.* p. 156. [4] Arbousset, *op. cit.* p. 493.
[5] W. Patterson, *A Narrative of Four Journeys into the Country of the Hottentots and Caffraria*, 1777–1779, p. 117.
[6] W. Schmidt, "*Die Stellung der Pygmäenvölker in der Entwicklungs-Geschichte des Menschen*," Stuttgart, 1910, p. 48.

existing among the pygmy races of Mkabba on Lake Ngami, where the mutilation is a tribal sign. It also occurs among the Babongs on the Upper Ogue.

Some of the Red Indians, such as the Tlingit, Tsimshian and Haida tribes of North-Western Canada,[1] where the reindeer still exists, also cut off the little finger, but only on special occasions; when, for instance, death is too assiduous in his visits to a family the survivors agree to perform the ceremony at the next funeral, and when this takes place they lay the little finger on the edge of the coffin and sacrifice the last joint, in order, as they say, "to cut off the deaths."

Catlin[2] describes the amputation of the forefinger and little finger of the left hand as forming part of the terrible initiation ceremony of the Mandan Indians.

The Californians,[3] the Nateotetains, another North American tribe, and the Dakotas also practise the rite;[4] and Mr. G. B. Grinnell, who informs me that it is common among the Indians of the plains, thinks that it formerly prevailed all over the North American continent. He writes, "I was once present when the body of a Crow chief killed in battle was brought into camp, and saw his mother and a male relative each cut off a little finger of the left hand to show the sincerity of their grief. This was at Camp Lewis (now Lewistown) in Montana," and he adds that an old Ree, who had lost three fingers of his left hand, told him he had cut them off as an offering to the higher powers, that he might take vengeance on a hated foe. The sacrifice was accepted; at all events he killed his man.

[1] F. Boas, "Report on the N.W. Tribes of Canada," *Rep. Brit. Ass.*, Cardiff, 1889, p. 837.
[2] Catlin, *North American Indians*, i, p. 172.
[3] Ninegas, *Noticia de la California*, i, p. 117.
[4] Herbert Spencer, *Principles of Sociology*, p. 291.

The custom is also prevalent among many of the Pacific islands, where it did not escape the notice of Captain Cook,[1] who states that in Tonga the finger is sacrificed to propitiate the god Atoa. During the illness of a Tooi-tonga (a divine chief), his friends, according to Mariner,[2] seek to appease the god by the daily sacrifice of a little finger, not one of their own, but of some young relative of the chief; hence, if a man had many relatives of superior rank to himself he would not part with a whole finger joint at once, but prudently keep some of it for emergencies, cutting off only a little bit at a time; yet the same author makes mention of two young Tongans only five years old, who were fighting tooth and nail for the honour of suffering for the Lord of their land. On the island of Lifuka, one of the Tonga group, Erskine[3] records how the chief, King George, offered up one joint of his little finger; and he says that this amputation, known as "tutuanima," was still common in his time as a universal sign of mourning and as a propitiation in sickness or misfortune.

In Fiji amputation was practised for more than one reason. It is recorded that on the death of a king orders were issued that one hundred fingers should be cut off.[4]

Among the Mafulu, a pygmy Negrito race of New Guinea, it is a common though not universal custom for a woman who has lost a child, especially if it is a first-born or much loved, to take off one of her fingers, and she may sacrifice a second or even a third finger for subsequent losses, it may be for a husband or mother.[5]

[1] Cook, *Voyages round the World*, London, 1897, Second Voyage (1773), p 255.

[2] W. Mariner, *An Account of the Natives of the Tonga Islands*, London, 1817, i, p. 454; ii, p. 222.

[3] Erskine, *Journal of a Cruise in the West Pacific*, 1852, p. 123.

[4] J. A. Farrar, *Primitive Manners and Customs*, London, 1879, p. 143.

[5] R. W. Williamson, *The Mafulu Mountain People of British New Guinea*, London, 1912, p. 247.

So, too, among the Nicobar islanders. On the death of her husband the wife has one finger joint cut off.[1] Barbarous as the custom may seem to us it is a vast improvement on the suttee of India, to which country we now pass.

In the peninsula of India, among the Dravidians of Mysore, there is a sect of the Morasa Vakkaliga (wild husbandmen) known as the Berula Kodó (*i.e.* people who give the finger).[2] The sacrifice, which is attended by an elaborate ritual, is made the occasion of a great religious festival which is held on certain holy days at intervals of a few years. A large number of women are operated upon at each festival. The officiating priest is the headman of the village, who may be at the same time the village blacksmith, and thus skilful by practice in the use of the chisel. He receives a regular fee for each case. It is the last two joints of the third and fourth fingers of the right hand that are removed.

The existing accounts of the ceremony, which are numerous, do not agree among themselves in explaining what determines the sacrifice. In one of the earliest,[3] it is asserted that "every woman previous to the piercing of the ears of her eldest daughter," as a preliminary to betrothal, must undergo the amputation; in one of the latest,[4] on the other hand, it is said that the sacrifice

[1] E. Tylor, *Primitive Culture*, London, 1891, ii, p. 400.

[2] Wilkes, *Historical Sketches of the South of India*, London, 1810, 4to, 4 vols., i, p. 441; F. Buchanan (Hamilton), *East Indian Gazetteer*, 1815, and *A Journey from Madras*, 1807, i, p. 319; *Indian Antiquary*, 1873, ii; *Manual of Salem District*, 1883; F. Fawcett, on the "Berulu Kodo, a sub-sect of the Moras Vokaligaru of the Mysore Province," *Journal of the Anthropological Society of Bombay*, 1889, i, pp. 449–474, *Census Report*, 1891; Abbé Dubois, *Hindu Manners and Customs*, ed. 1897, p. 27; *Madras Government Museum*, 1903, Bull. 3, iv, p. 193; E. Thurston and R. Rangachari, *Castes and Tribes of Southern India*, 1909, v, p. 75.

[3] Wilkes, *loc. cit.* This possibly refers simply to the time of life at which the operation was performed, the reason not being given.

[4] F. Fawcett, *loc. cit.*

must be made for every individual, whether boy or girl, who is born into the sect. In this case it would seem that there must be sometimes a difficulty in finding enough fingers of the right kind to go round. According to another account[1] it is only when a man becomes a grandfather that a finger is cut off; but it is not the grandfather who gives his finger; it is the aunt! (wife of the eldest son of the grandfather).

At the present day the actual sacrifice is seldom, if ever, carried out, a symbolical representation of one kind or another taking its place. Thus, in one district the victim presents her hand to the priest with a piece of gold wire twisted round the sacrificial finger, and the removal of this symbolises the amputation. Since the victim keeps her finger, and the priest keeps the gold, and the god is satisfied we might imagine that everyone would be pleased all round; but strange to say, this is by no means the case. The women regret the ancient dispensation, not that they have any religious scruples, but that the esteem in which they were formerly held is, they say, abated, and this may be true, if we accept the statement that a mutilated finger was always regarded as a sign of chastity.[2]

On a review of this evidence, it will be seen that we have here another instance of a singular practice which is common to a great number of peoples who are isolated, and have long been isolated, from one another by great distances and other geographical obstacles. There is room, no doubt, for more than one explanation, but the simplest and most satisfactory would seem to be that which is based on the great antiquity of the custom,[3] for

[1] *Census Report, loc. cit.*

[2] Among these people we meet with much that reminds us of the Australians, especially in their matrimonial rules and system of relationships.

[3] We may connect with its antiquity the diversified circumstances

as we shall see later, it was already in existence at a time when the forefathers of these now widely separated races were probably in direct or indirect communication with one another. If, as may well have been the case, they once occupied the Old World, that cradle of the human race, and have since been dispersed to their existing homes, carrying their ancient customs with them, our problem would be solved.

It happens, fortunately for our inquiry, that amongst most of the people who amputate the fingers there is a custom also of imprinting the outline of the hand on the walls of caves or the face of a cliff. There are various ways of doing this, a common plan is to shield the surface of the rock with the out-spread hand and then to apply pigment all round it; by this method the hand is left in blank on a coloured ground; but sometimes direct impressions are obtained by smearing the hand with pigment, and then stamping it on the rock. We may distinguish these as positive, the others as negative imprints. Imprints, both positive and negative, have been observed on the walls of caves in California, Arizona, Peru, Africa, and Australia—the red hand has also been observed in Egypt, Palestine, Arabia, Babylonia, India, Phœnicia and Mexico. But what is of especial interest to us—it started us indeed on this long disquisition—is the fact that they also occur in the painted caves of France and Spain. None of the imprints found in the cave of Castillo show any signs of mutilation, but if we turn to Gargas we encounter a truly shocking spectacle. Altogether there can scarcely be fewer than 200 imprints

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which demand its performance, sometimes birth (Mysore), sometimes death (North American Indians and others), sometimes sickness (Tonga and elsewhere), at others a vindicative desire for justice (Ree chief); in all these cases as a propitiatory sacrifice, but degenerating in others to a mere sign of caste, calling, or tribe.

on the walls of this cave and among these a large number are sadly mutilated (Fig. 222).

It is not merely the last joint of the little finger that is missing; no finger enjoys any preference, any one or all of them may be shortened; in some cases all the digits including the thumb have lost their last two joints, so that they look less like fingers than toes.

FIG. 222.—Silhouettes of hands in red and black; on the right (not lettered) from the cave at Gargas; on the left attempts to imitate them, A, D, by sifting rouge over a hand spread out horizontally, B, C, D, F, with a crayon, G, by blowing charcoal out of the mouth against a hand placed against a vertical wall, H, by blowing it out of a tube.

Here then we seem to have evidence that the custom was already flourishing in Aurignacian times and practised with a virulence that is without example among existing tribes.

It may be as well before accepting this conclusion to consider what objections can be raised against it. To begin with, the fact will be recalled that sacrifice tends to become more symbolic than real. In China the wife and slaves and horses are no longer buried along with a deceased mandarin; paper models of them are found to

do just as well and are much less expensive. How, then, would it be if the Aurignacian folded down his fingers when he placed his hand against the wall to leave its mark? Primitive people are sometimes primitive enough to think that they can deceive their gods. What more admirable deception than this! "Behold, Atoa! my veritable sign manual on the wall! and you can see for yourself that I have not been sparing, for all the fingers are missing!"

But is it possible to "fake" the marks in this way? To answer this question my friend and former pupil, Miss Byrne, of Somerville College, and I have made some experiments. Various methods were tried, and the results are shown in Fig. 222. Placing the hand either prone or supine on a sheet of paper, with the finger it is intended to shorten folded back, the outline may be traced with a crayon, such as the chalk used for writing on a blackboard; this is the simplest and neatest plan (Fig. 222 B, C, D, F). We know that the Aurignacians possessed crayons of red ochre (Fig. 191, p. 380), and they may have made use of them for this purpose. It is asserted, and there can be no doubt of the fact, that the Australians sometimes employ a different device: filling their mouth with red ochre or charcoal, they puff the pigment against the hand while it covers the dampened face of a rock; the Aurignacians may have done the same, but we have no evidence to prove that they did. For myself I have not tried this plan, but Miss Byrne has made one attempt and with a fair amount of success (Fig. 222 G). It would require more practice, however, than she is disposed to make to obtain skill in this art. As a substitute I tried sifting fine rouge over the hand laid on gummy paper, or blowing it through a tube (Fig. 222 A, E, H).

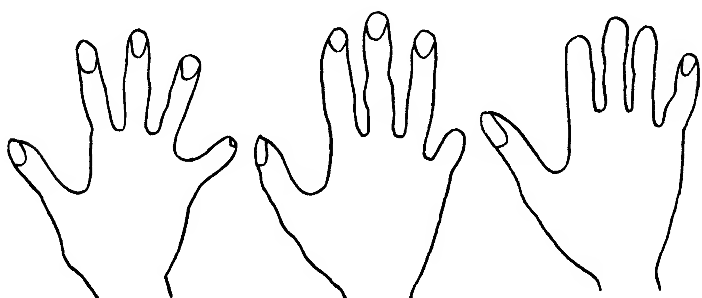
These experiments prove that the appearance of amputation can be obtained without proceeding to that extreme, and it is tempting to suppose that the Aurignacians, who were evidently very gifted people, had already passed through the stage in which their religious cult demanded the sacrifice of the actual finger, and had arrived at the notion of symbolic representation. If so the restriction of the sacrifice to the little finger might soon lose its meaning, and any or all of the fingers might be suppressed, perhaps according to a scale of fees imposed by the officiating priest or medicine-man!

Pleasant as it would be thus to explain away the rows of mutilated hands in the cave of Gargas, we cannot stop here, but must push our inquiries a little further.

In the first place, the apparent discordance between the facts as indicated by the Aurignacian imprints and the practice of modern races is not so great as it appears. Thus, although it is true that some races sacrifice only the little finger, yet it is also true that others are more generous, and even in those cases where travellers have asserted that the mutilation is restricted to a single finger, it can be plainly shown that they were mistaken. Nothing can be more definite than the statements of Patterson, and even of Burchell, whose reputation for close and exact observation is so deservedly great; yet how dangerous it would be to generalise from them we will now make clear. Some years ago several Bushmen were exhibited in Berlin, and Virchow,[1] the eminent anatomist, was able to examine them. He seems to have known nothing of mutilation as a custom, and his description of their hands, which is fortunately accompanied by illustrations, is purely anatomical.

[1] R. Virchow, "Buschmanner," *Zeits. f. Ethn.*, 1886, xviii, pp. 221–239, in particular pp. 222–223.

In one instance (Fig. 223 C), contrary to what we should expect from the statements of travellers in South Africa, the little finger shows no sign of mutilation, while the first and second have each lost the last joint, and the third has lost the nail and finger-tip. Barrow [1] states that "in every sickness of what kind soever it is usual with them to take off the extreme joints of the fingers, beginning with the little finger of the left hand." In three of the cases described by Virchow they had evidently begun with the right hand.



A B C

FIG. 223.—Mutilated hands of Bushmen seen from the back. A, last joint of little finger amputated, but retains a rudiment of the nail; B, similar but with no trace of a nail; C, the last joint of the first and second finger and the tip of the third have been removed. A and B male, C female. (After Virchow.)

How far the mutilation may be carried among modern races is shown, assuming it to be correct, by Herbert Spencer's [2] statement that among the Nateotetains, a tribe of North American Indians, "some old women may be seen with two joints cut off every finger of both hands." This is as extreme a case as any recorded by the Aurignacians.

Again the only known case in which the sacrifice has been softened into symbolism is that of the Dravidians

[1] Barrow, *op. cit.*, i, p. 245.
[2] Herbert Spencer, *tom. cit.*, p. 291.

of Mysore, and here it does not appear that the change was spontaneous; it seems to have been a compromise forced upon the people from without, by the action, indeed, of the British Government in India.

Finally, if, as we must admit is probable, the imprints were made in the Australian fashion by blowing powdered pigment out of the mouth, then it is doubtful whether our experiments have proved that the records can be manipulated in the artful manner we have supposed. It is very difficult to keep the folded fingers in such close contact with the wall as to prevent some of the pigment from getting underneath them and thus, as will be seen by reference to Fig. 222 G, H, the imprints made in this way are by no means so sharp and clean as most of those in Gargas.[1]

Thus on the whole the weight of evidence is distinctly in favour of the simple and obvious interpretation with which we so mistrustfully set out.

But even if this were not so, the simulation of mutilation would be sufficient proof in any case to show that the custom of mutilating the hand was already in existence in Aurignacian times, or before, and thus our explanation of its present or recent distribution is so far confirmed.

We have now passed in review some of the best examples of the mural art as it existed in the Palæolithic epoch, and we cannot survey the series of pictures with which primitive man has illustrated the animal life of his time without a feeling of delight; the pleasure which we feel in this glimpse of a vanished fauna is enhanced

[1] It is stated, however, that the Australian natives sometimes smear the palm of the hand with animal fat to prevent the pigment from getting underneath, and thus ensure a sharp impression. By this simple means our results could have been much improved. See R. H. Matthews, *Proc. R. Soc. Vict.*, 1895, vii.

by the fact that we look at it through the eyes of the ancient hunter himself. The pictures seem to be a pure study of nature, expressing the vivid sympathy of the artist with the world around him. Of so much we may feel assured, yet this may not be all. Without a full understanding of the civilisation of a race we cannot understand its art. Our own minds are saturated with the influence of our age, and the art of the ancient hunters may have meant something very different and something much more to them than it does to us. Indeed, M. Salomon Reinach has endeavoured to show that it was intimately bound up with their religion or magic.[1] He points out that all the animals represented are such as are desirable for food: "undesirable" animals, such as lions, bears, and tigers, are never depicted.[2] But it is a widely spread belief, once apparently universal, that the image of an object gives the possessor some sort of hold upon it, and thus, by drawing the likeness of these animals, primitive man might have thought to influence them in the chase. When we speak, M. Reinach remarks, of the magic of the artist's pencil, we use a metaphor which had once a literal meaning.

Again, in the initiation ceremonies practised among the Australian aborigines, a sacred figure, which the women and uninitiated are not permitted to see, plays an important part; and in connexion with this the singular fact is cited that the animal figures in the caves never occur in the better illuminated parts, but always

[1] S. Reinach, "L'Art et la magie à propos des peintures et des gravures de l'âge du Renne," *L'Anthr.*, 1903, xiv, p. 257; also *Cultes, mythes et religions*, Paris, 1905, i, p. 131.

[2] This, however, can no longer be maintained. There are a lion, a bear, and a wolf on the wall of Combarelles, and a wolf is on the wall of Font-de-Gaume; the bear, however, was good eating. Indeed, it is impossible to say with certainty what Palæolithic man would not eat. Even that filthiest of animals, the hyena, seems on some occasions to have served as food, and we have already alluded to cannibal feasts.

at some distance from the entrance, where the obscurity is so great that nothing can be seen by civilised eyes without the aid of artificial light. At the same time no signs of smoke remain to show that the troglodytes made use of torches or similar means of illumination. There is less mystery in this, however, than has been supposed; the eyes of primitive races are not superior to our own, and the artists could not paint without light; they certainly possessed lamps, and an Eskimo lamp, which gives a good light, does not smoke when

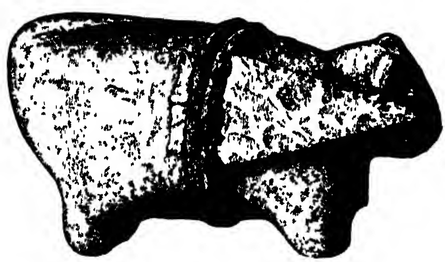


FIG. 224.—A mountain lion "fetish." (After Cushing.)

properly tended. The absence of pictures near the entrance is probably due to their destruction by weathering.

But a more appropriate illustration is perhaps afforded by the Zuñi Indians[1] of New Mexico. This people is divided on a very natural basis into a number of totem clans, one of which has the mountain lion for its totem. Each hunter who belongs to the priestly brotherhood carves an image of his totem (Fig. 224) out of some kind of stone. If the piece of stone has, to begin with, some semblance of the form of a mountain lion, so much the better; it will possess more magic when virtue is conferred upon it. (This may explain why the Palæolithic

[1] *Reports Bureau of Ethnology*, Washington, 1883, ii; 1886, iv; 1887, v; 1896, xiii; 1904, xxiii, in particular ii; F. H. Cushing, *Zuñi Fetishes*,

hunters sometimes selected a boss of rock within the cave which only required the assistance of art to assume an obvious animal form.) The carving finished, they bind over the region of the heart a flint arrow-head (Fig. 224), the equivalent perhaps of the arrows painted on the side of the bison in Font-de-Gaume; and it may be that the heart of the elephant painted on the walls of Pindal (Fig. 203) is a variant on this motive,

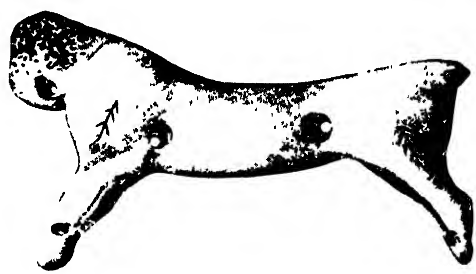


FIG. 225.—A feline animal[1] carved out of reindeer's horn found in a Magdalenian deposit in the Grotte d'Isturitz, Basses-Pyrénées, for comparison with Fig. 224. (After Passemard. × $\frac{3}{5}$.)

symbolising the centre of life and, as the Zuñis regard it, the source of magic.

The graven images are kept together in a basket, which is deposited in the "House of the Deer Medicine," and guarded by an official keeper.

At the festival of the New Year they are removed and arranged in front of an altar in a sacred chamber where the members of certain priestly orders assemble for a religious service. A priest presides and prayers are offered up, the burden of which is much like our own "Give us this day our daily bread." The assisting worshippers join in the responses, just as we do in the Litany, and use an expression which means "Amen."

[1] Another image of a feline animal carved in soft stone is figured by the Abbé Breuil from Isturitz. Capitan, Breuil and Peyrony, *La Caverne de Font-de-Gaume*, Monaco, 1910, p. 153.

Through this service the images receive a blessing and become charged with magic powers. Every hunter carries one with him to bring him good luck when he goes a-hunting.

Additional evidence of the same kind is furnished by the Ojibwa Indians[1]; the medicine man or shaman makes a drawing of the animal to be hunted, an elk for instance (Fig. 226, 2, 3) on birch bark or on the

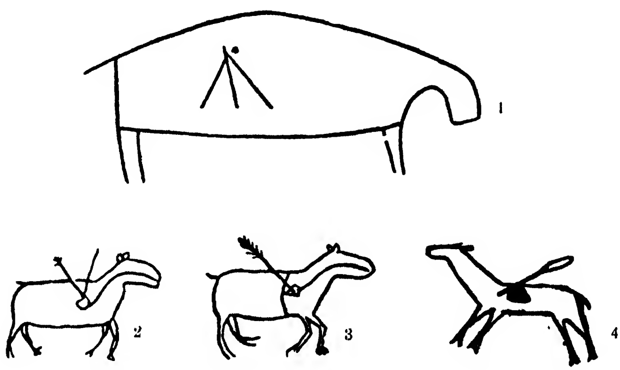


FIG. 226.—1, Arrow on the flank of a wounded animal, the wound being indicated by a dot to the right of the arrow. Wisconsin (after Mallery); 2, 3, outlines of elks addressed in magic hunting song; 4, elk, recording a successful hunt; Ojibwa Indians. (After Hoffman.)

ground; the heart he paints in with vermilion, and draws a line to it from the mouth—the line of life—along which the magic he invokes is conducted inwards. He then sings the magic song, one verse of which is directly addressed to the animal (Fig. 226, 2) thus :—

> "I shoot your heart; I hit your heart,
> Oh! animal—your heart—I hit your heart!"

and concludes by extolling his own powers, as he points to his second sketch (Fig. 226, 3) :—

> "I am such, I am such, my friends;
> Any animal, my friends, I hit him true, my friends."

[1] W. J. Hoffman, *Ann. Report Bur. Ethn.*, 1891, vii, p. 221 *et seq.*, in particular p. 247.

But similar drawings (Fig. 226, 4) are made by these Indians to record a successful hunt,[1] as in the illustration which refers to a hunt when it is said that one hundred elk were killed. It will be observed that in this case the line of life is omitted.

The pictograph (Fig. 226, 1) from the face of a rock in Wisconsin [2] is no doubt also a record.

It is not improbable that the ancient paintings were connected, like the "fetishes" of the Zuñi or the drawings of the Ojibwa Indians, with an esoteric cult—half magic, half religion; and it is even possible that art itself may have originated in the recognition of an accidental resemblance between some natural objects and animal forms and the subsequent endeavour to strengthen this resemblance.

Such an hypothesis is worthy of examination, but pending this we may prefer a different explanation. The desire for expression, so universal among men, finds its readiest and simplest satisfaction in art. Give some young Giotto a piece of chalk and he will make you a picture before he is twelve years old. The artist is the artist first, born not made, expressing himself with brush or burin out of pure spontaneity, simply because he cannot help it. "The beauty and the wonder and the power, the shapes of things, their colours, lights and shades"; it is to the irresistible appeal of these that he responds, and so makes a new wonder of them. That is the true magic of the artist's pencil. Religion may appropriate or inspire the achievements of art, but she does not create them.[3]

[1] Hoffman, *tom. cit.*, p. 280.

[2] G. Mallery, "Picture Writing of the American Indians," *Ann. Rep. Bur. Ethn.*, 1893, x, p. 126.

[3] The mind of primitive man was no doubt obsessed with a belief in magic, the fruitful parent of science and religion. But it would be a narrow view which could see nothing but magic in the ancient art, as

We must now set out on a rather difficult quest. What, we may ask, has become of this gifted Aurignacian race? Has it wholly vanished out of ken, either by extinction, or by transformation into a more civilised people, or by absorption into some conquering race, like say the Egyptians, or does it possibly still survive, retaining, more or less, its primitive characters?

In attempting to answer this question we may begin by confining our attention to the mural paintings and endeavour to discover whether there is any existing race which practises the same art. Drawing seems indeed to be almost as universal as speech: the Tasmanians could trace rude outlines of objects that excited their interest, and the Australians not only made impressions of the hand on rocks or the walls of caves, but even sketched, by painting or graving, outlines of men and animals.[1] These, however, are extremely

narrow as that which could be blind to all but æsthetic satisfaction. The motives here as in general were probably numerous, various and sometimes complex. So much may be definitely asserted on the basis of observations made by qualified investigators of existing hunting tribes.

[1] They were first observed by Capt. Cook, then by Flinders (*Voyage to Terra Australis*, 1803, ii, p. 188). There is an extensive literature on the subject; the following list is by no means complete: P. P. King, *Coasts of Australia*, 1827, ii, p. 26 *et seq.*, no figs.; G. Grey, *Journals of Two Expeditions of Discovery in N.W. and W. Australia*, London, 1841, i, pp. 201–215, pls.; J. L. Stokes, *Discoveries in Australia*, London, 1846, ii, p. 169, pl.; R. Brough Smith, *The Aborigines of Australia*, 1878, i, p. 308, fig. 88; J. C. Cox, "Drawings by Australian Aborigines," *Proc. Linn. Soc. N.S.W.*, 1878, iii, p. 155, pls. (these drawings are on bark); H. Tryon, "On an Undescribed Class of Rock Drawings of Aborigines in Queensland," *Proc. Roy. Soc. Queensland*, 1884, i, p. 45, pl.; G. B. Barton, *History of New South Wales from the Records*, Sydney, 1889, i, p. 290; R. Etheridge, junr., *Records Geol. Surv. N.S.W.*, 1889, i, p. 146, pl.; 1890, ii, p. 29, pl.; 1892, ii, p. 177, pl.; 1893, iii, p. 33, and p. 80, pl.; *ibid.*, *Records Australian Museum*, 1903–5, v, p. 118, pl., and p. 271, pl.; 1908–10, vii, p. 80, figs.; Phillip, *The Voyage of Governor Phillip to Botany Bay*, London, 1790, p. 89; J. Mathew, "The Cave Paintings of Australia," *Journ. Roy. Anthr. Inst.*, 1893, xxiii, p. 42, pls.; *ibid.*, "Notes on Aboriginal Rock Paintings, Victoria," *Proc. R. Soc. Victoria*, 1897, ix, p. 29, pl.; *ibid.*, *Eagle-Hawk and Crow*, London, 1899, pp. 125–140, pls.; R. H. Matthews, "Rock Paintings, Bulgar Creek

crude, and never rise to the same artistic level as the paintings and sketches of Palæolithic man.

In Queensland, which is open to influence coming from the North, we meet with conventional symbols, such as the universal sign for man (Fig. 348 *d*) and cartouches bearing lines which remotely resemble the

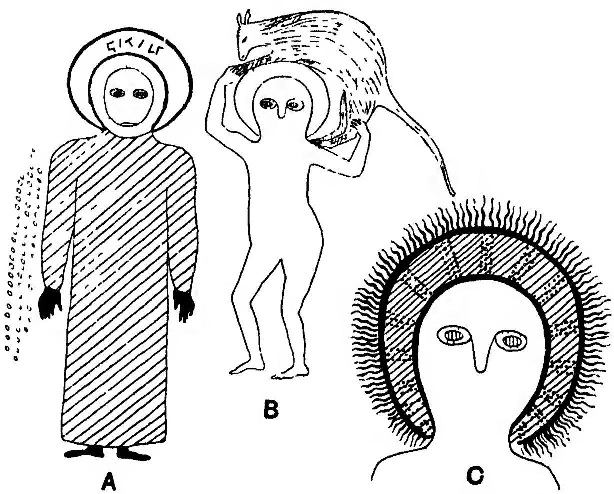


FIG. 227.—Figures from the caves of the Glenelg Valley, N.W. Australia. Black here represents deep red in the originals; oblique lines, light red; dots, yellow, and vertical lines (as in the eyes), blue. All the lines in B, except the eyes, are in red. (After Grey. Much reduced. In the original the figure A is 10 feet 6 inches in height.)

markings on Azilian pebbles.[1] There are also, however, polychrome paintings in Australia. Some of the most remarkable of these were observed more than seventy years ago by Sir George Grey [2] in caves which open on

near Singleton, N.S.W.," *Journ. R. Soc. N.S.W.* for 1903 [1904], xxvii, p. 358, pls.; *ibid.*, "Aboriginal Rock Paintings and Carvings in N.S.W.," *Proc. R. Soc. Victoria*, 1895, vii, pls.; E. Giles, *Travels in Central Australia*, Melbourne, 1875, pls.; Campbell, "Aboriginal Carvings of Port Jackson and Botany Bay," *Mem. Geol. Surv. Ethn. Ser.*, 1899, i; W. W. Thorpe, "Aboriginal Drawings in Rock Shelters at Bundanoon, N.S.W.," *Rec. Austr. Mus.*, 1908–10, vii, p. 325 pl.; W. E. Roth, *Ethnological Studies*, London, 1897, p. 116, fig.

[1] Tryon, *loc. cit.* [2] G. Grey, *loc. cit.*

the precipitous sides of the Glenelg Valley, in North-Western Australia; they represent (Fig. 227) men and women (who were certainly not Australians) and the kangaroo. Both men and women wear a singular head-dress, in some cases coloured red, in others blue; it has been described as a halo, but in B (Fig. 227) it is helping to support a kangaroo, and a halo would hardly be strong enough for that. Can these pictures represent a shipwrecked crew, the men in sailors' hats, and the

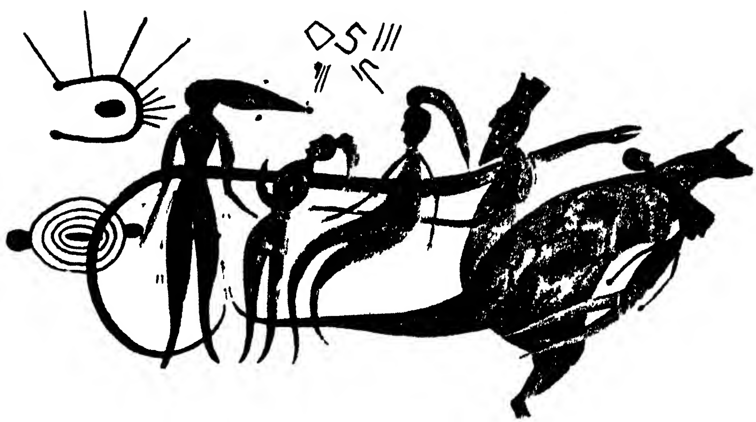


FIG. 228.—Painting in cave on Prince Regent's River, Fitzroy River, N.W. Australia. (After Bradshaw.)

women (whose halos are more ornate) in bonnets? And what kind of reckoning was kept by the three rows of sixty-one dots? The halo (?) of the man A is inscribed with characters which look very like letters indicating, the irreverent might suppose, the name of his ship; but Mr. J. Mathew, who thinks they are of Sumatran origin, transliterates the first four into "Daibai" and suggests that the whole word is equivalent to "Daibattah," the name of a deity of the Battas of Sumatra. But additional characters, evidently belonging to the same script, occur in some still more mysterious paintings

(Fig. 228), which have since been found in the same district, though at a considerable distance from Glenelg, and these Mr. Mathew does not interpret.[1] It is doubtful whether any of these polychromes are of indigenous origin, and whatever their meaning, they certainly belong to a very different school from the Aurignacian.

The inhabitants of America, both North (Colorado, Arizona, Mexico) and South (Peru, Patagonia) have also left imprints of the hand on the rocks, as well as painting or carvings,[2] (Fig. 229) which are not unlike some of the ancient work in Europe.

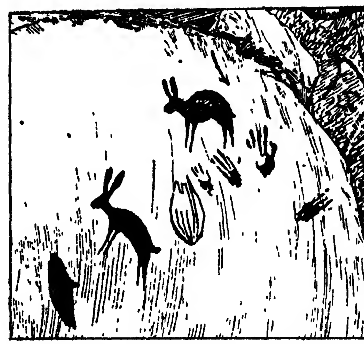


FIG. 229.—Paintings in red and impressions of hands on a block of granite in the Sierra de la Cacachillas, Lower California. (After Diguet, *L'Anthr.*)

The art of the ancient Mexicans was so different that it can hardly be brought into this comparison; that of the Egyptians makes a nearer approach, but it stands on a still higher plane. Africa, however, furnishes us with another people, still in much the same stage of culture as the Aurignacian, inhabiting caves, and decorating the walls with paintings, both monochrome and polychrome, which recall in the closest manner some of

[1] J. Bradshaw, "Notes on a Recent Trip to Prince Regent's River," *Roy. Geogr. Soc. Austr.*, 1892, ix, pt. 2, p. 99 *et seq.*; T. Worsnop, "The Prehistoric Arts of the Aborigines of Australia," *Australasian Association for the Advancement of Science*, 1895, vi, p. 135 *et seq.*, pls.

[2] *Report Bureau of American Ethnology*, pp. 98, 118, 138; C. Mindeleff, *Cliff Ruins of Arizona*, 1897, xvi, p. 153, pl. lv; p. 178, fig. 74, p. 181; M. C. Stevenson, *The Zuñi Indians*, 1904, xxiii, p. 42, pl. vii; p. 233, pl. xlviii; J. W. Fewkes, *The Aborigines of Porto Rico*, 1907, xxv, p. 42, pl. vii; p. 223, pl. xlviii. The Zuñi and related Indians also represent sacred animals on the walls of the sacred chambers in which the altar is set up. They are painted in brilliant colours.

the most as well as some of the least successful efforts of Aurignacian times.[1] These are the Bushmen, a race which once spread over a great part of South Africa, but now maintains an unequal struggle for existence in the Kalahari desert. Most of their paintings represent scenes from the chase; in the accompanying illustration (Fig. 230) a group of elands is shown attacked by lions.

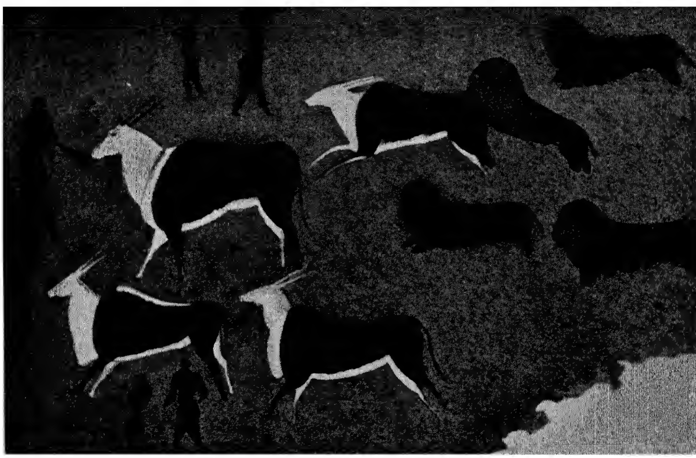


FIG. 230.—Elands pursued by lions. The elands are painted in white and graduated shades of orange and yellow; the lions are pale yellow, and the Bushmen black. From the Lower Invani, Queenstown Division, Cape Colony. (After Stow. × $\frac{1}{30}$ about.)

A good deal of the original effect is lost by the translation of the various tints into black and white, but it will be perceived that the outlines are firmly and correctly drawn—those indeed who are familiar with the eland speak of this as a perfect representation.

In the next illustration (Fig. 231) the five birds to the left represent real ostriches; that which seems to be one on the right is a Bushman disguised as an ostrich;

[1] Impressions of the human hand are also met with on the walls of these caves.

the extended bow betrays him. The colours in this are not so nicely graduated as in the preceding, but it is a good picture, the outlines are well drawn, the attitudes

FIG. 231.—A group of ostriches and a Bushman hunter disguised as an ostrich, painted in black and white, except the two birds in half-tone which are greyish-blue. From Cape Colony. (After Stow. × nearly $\frac{1}{30}$.)

of the birds true to life, and the grouping is extremely skilful. An Aurignacian or a Magdalenian could not have done better.

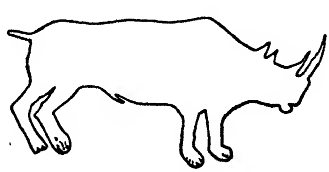


FIG. 232.—Outline of a picture of a rhinoceros. (After Fritsch.)

The outline of a rhinoceros shown in Fig. 232 is remarkably true to nature.

The incident represented in Fig. 233 throws an interesting light on the relations which existed between

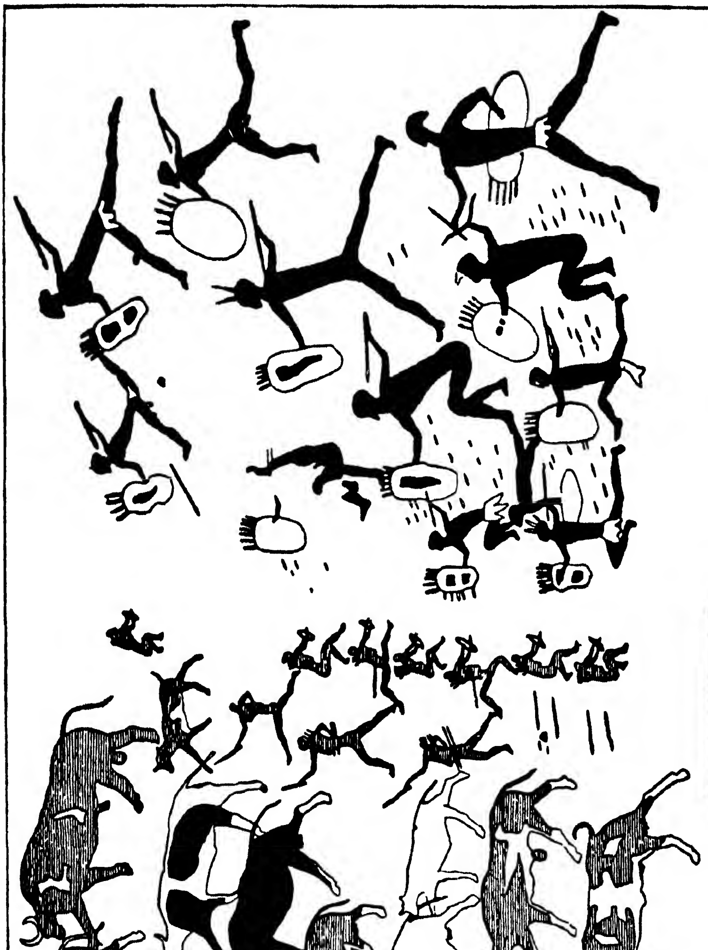
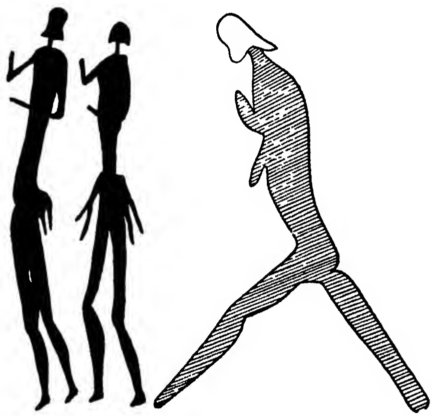


FIG. 233.—A Bushman cattle-raid; pursuit by the Kaffirs and rear-guard action. From a cave near

the Bushmen and their powerful neighbours, the Kaffirs. The latter, a warlike but pastoral people, encroached from time to time on the hunting grounds of the Bushmen, and thus robbed them of their natural source of food. As the only possible means of compensation the Bushmen retaliated by lifting the Kaffirs' cattle,[1] and in the picture we are told the story of a successful cattle raid. We see the Bushmen driving away the



1 2.

FIG. 234.—Bushman paintings. 1. Kaffir women from Julijskraal, Orangia. (After Johnson. × ½.) 2. Human figure painted in reddish-yellow (oblique lines) and white. From Cape Colony. (After Tongue. × ⅙.)

herd, and the tall Kaffirs, armed with assegais, rushing upon them in leaps and bounds, till brought up sharp by the plucky little archers who protect the rear.

Among the Bushmen paintings of the human form are several which recall those of Cogul (Figs. 215, 216); some present a similar treatment of the head (Fig. 234), others of the dress (Fig. 235). Precise resemblance is, of course, not to be expected; allowance must be made for changes in fashion and differences in climate.

[1] "In lifting cattle, Mercury himself could not have been more expert," Burchell, *op. cit.*, ii, p. 71.

In Fig. 236, which recalls the hunting scene (Fig. 216) from Cogul, we recognise the rows of dots with which we are already familiar in various Aurignacian and Australian paintings, as well as sharply undulating lines, which resemble in some degree the macaroni of Gargas and elsewhere.

Barrow [1] observed in the caves of the Sneuberg district

FIG. 235.—Bushman paintings. 1. Steatopygous figure painted in red, from Ladybrand Commonage, Orangia. (After Tongue. × about ½.) 2. Female figure with fringed gown, from Orangia. After Johnson. × ¼.) 3, 3′, 3″. Three draped figures forming part of a procession; oblique lines represent red; from Greenvale, Cape Colony. (After Tongue. × ¼.)

a number of crosses, circles, dots and lines, placed in a long row as if to convey some meaning, which, however, he did not discover. Hahn [2] was more fortunate with two signs in the Orange district; one of these, a circle with a dot in the centre, indicates a natural hole, or cistern, in the rocks, and I fancy its meaning might be extended to include a spring blocked up by a round slab with a plugged-up hole in the centre, such as

[1] John Barrow, *op. cit.*, i, p. 29.
[2] T. Hahn, *Zeits. f. Ethn.*, 1879, xi, p. 307.

occur in Bushman's land; the other a T, placed vertical, sideways ⊣, or inverted ⊥, represents the well-

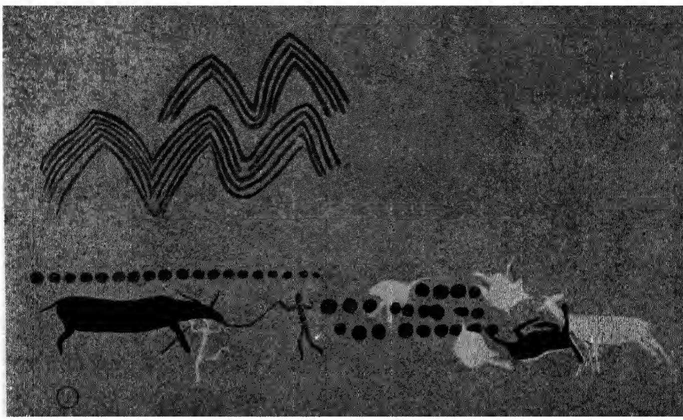


FIG. 236.—Part of a long picture showing undulating lines (recalling 'macaroni'), rows of dots, Bushmen and animals, from Zuurfontein, Cape Colony. (After Tongue. × about $\frac{1}{5}$.)

known jackal's tail (p. 470), made from a strip of fell cut from the forehead of the zebra. These explanations

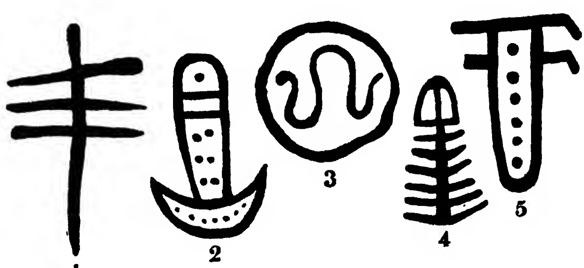


FIG. 237.—Symbols cut in striated rocks on the banks of the Gumaap, Griqualand West. (After Stow. × $\frac{1}{28}$.)

were gladly given by an old Bushman, who was a painter himself.

The symbols in the next figure are peculiar (Fig. 237), and, with the doubtful exception of the first, not known

out of South Africa; their meaning is unknown, and all chance of discovering it is now irretrievably lost.

There are obvious differences between the Aurignacian and the Bushman paintings: but they are outweighed by the similarity; the technique is much the same, there is the same division into two classes, one of elaborate portraiture with its realistic truth, the other expressing, by simplified forms, scenes full of active movement, often a narrative as distinguished from a simply descriptive art. Certainly of all existing hunting tribes the Bushmen make the closest approach in their art to that of the Aurignacian age. This at least may be affirmed. If we assume as a working hypothesis a close alliance between these two schools of painting, can we advance a step farther and assume that the Bushmen and the Aurignacian race are closely connected by blood? By no means. We cannot argue from identity of culture to identity of race; the error of the philologist in treating a communicable character as an inborn gift has caused trouble enough in this respect, and we cannot be sufficiently on our guard against it. But there is no reason why we should not continue our inquiry, and as a next step seek for evidence of another kind, this time anatomical. If we attentively examine the Bushmen as they are represented in their paintings, we shall perceive a peculiarity in their outline, owing to that excessive development of one feature which is known as steatopygy. Direct observation of existing Bushmen shows them to be steatopygous; the Hottentots are still more so. In the women of these races this character is associated with another, that is, a remarkable elongation of the *labia minora*, so that they are sometimes spoken of as longinymph. European women are sometimes slightly longinymph, but not at the same

time steatopygous; the association of these two characters is peculiar to the Bushmen, Hottentots, and perhaps the Accas. The greater the development of these features, the greater the approach to a Hottentot's ideal standard of beauty.

If we now return to Aurignacian man we shall find that although for some inscrutable reason he usually refrained from depicting the human form, yet he had no scruple about sculpturing it in the round; he by no means restricted himself to this subject, but he seems to have taken a special pleasure in carving figurines, which almost invariably represent woman in the nude. A considerable number of these have been discovered in various caves, as at Brassempouy (Figs. 239 A, B, C; 242 A; 243 A, B, C), Barma grande (Mentone) (Fig. 242 B), Pont-à-Lesse (Belgium) (Fig. 242 C), and in the löss at Předmost (Moravia); at least a dozen are preserved in the Museum at St. Germain near Paris.

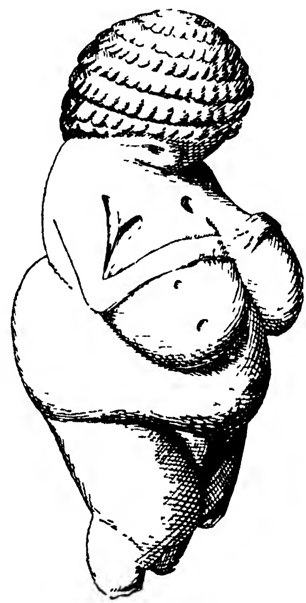


FIG. 238.—Aurignacian figurine. The Venus of Willendorf, carved in oolitic limestone, and originally painted with red ochre, 11 cm. in height, from Willendorf, on the Danube. (After Szombathy.)

A specimen of great interest has been obtained from an Upper Aurignacian horizon in the löss of Willendorf, on the left bank of the Danube, 20 kilometres above Krems (Fig. 238).[1] As in most of the statuettes,

[1] Szombathy, "Die Aurignacienschichten im Löss von Willendorf," *Korrespondenz-Blatt, Deutsch. Ges. Anthr.*, 1909, xl, pp. 85–88.

the face is not worked out in detail, probably the artist felt unequal to the task, but the hair is rendered in a

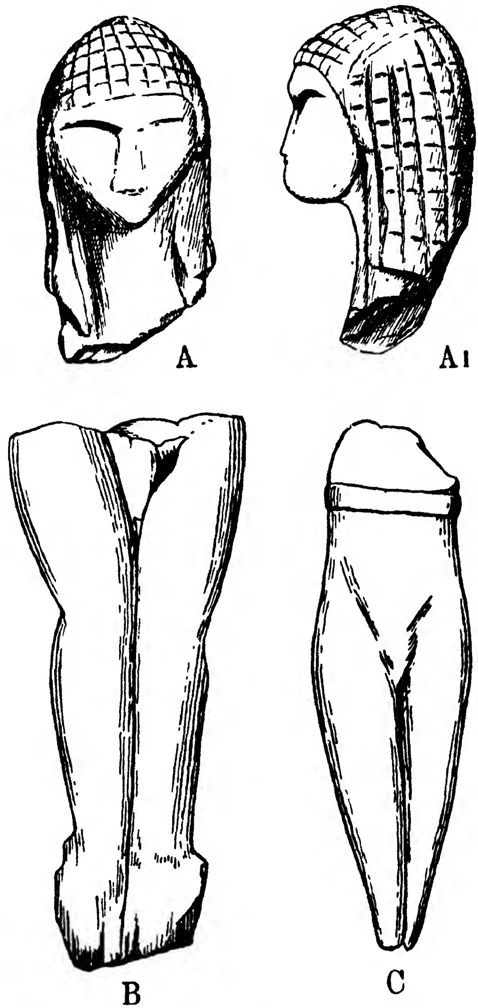


Fig. 239.—Aurignacian figurines. A, figurine à la capuche; B, l'ébauche; C, figurine à la ceinture. All in ivory, from Brassempouy. (After Piette, *L'Anthr.* Nat. size.)

way that suggests the "pepper-corn" tufts of Negroid races.

The human form is also represented, not by statuettes, but by carvings in low relief at Laussel in Dordogne, where they were discovered by Dr. Lalanne.[1] One of them, by a rare exception, is the figure of a man (Fig. 240) possibly in the act of drawing a bow; it is singu-

FIG. 240.—Sculpture of a man in low relief, from Laussel, Aurignacian. (After Lalanne, *L'Anthr.* × about $\frac{1}{8}$.)

larly like some examples of Egyptian art; another representing a woman is carved high up on one side of the entrance to the cave (Fig. 241), and, with the exception of the face which the artist as usual has not dared to attempt, it is distinguished by the great

[1] G. Lalanne, "Bas-reliefs à figuration humaine de l'abri sous roche de Laussel (Dordogne)," *L'Anthropologie*, 1912, xxiii, pp. 129–149.

attention which has been paid to the correct rendering of anatomical details; in general appearance it is extremely Negroid. The woman holds in her right hand a bison's horn, the cornucopia of the Aurignacians. A third sculpture of a woman has been described from the

FIG. 241.—Sculpture of a woman on a fallen block which originally formed part of the portal to the cave of Laussel, Aurignacian. (After Lalanne, *L'Anthr.*)

same cave [1] and a fourth has been found but not yet fully described.[2]

[1] G. Lalanne, "Découverte d'un Bas-relief à représentation humaine dans les fouilles de Laussel," *L'Anthropologie*, 1911, xxii, pp. 257–260, pl.

[2] This last was bought secretly by a guest of the owner and discoverer, Dr. Lalanne, from one of Dr. Lalanne's workmen. The workman was punished for the theft by six months' imprisonment. The purchaser was Prof. Verworn of Bonn. The stolen sculpture is now in the Anthropo-

These various representations are of unequal merit; some are extremely crude, others, however, are true works of art, and well deserve the praise bestowed upon them by M. Salomon Reinach, who remarks that there are at least two examples among them which by their realism and intelligent rendering of the female form are superior to all the artistic productions of the Ægean and Babylonia.[1] They have been closely studied by E. Piette, who divides them into two groups, one modelled from a race which it is difficult to identify, and the other (Figs. 242 A, D, and 243 A) presenting just those characters which we have enumerated as peculiar to the Bushmen, Hottentots, and Accas. Thus as early as 1895, before the mural paintings of the caves had been recognised as genuine, Piette was able to assert that if we seek for the nearest representatives of the people represented by the steatopygous statuettes, we shall find them among the Bushmen.[2]

Certainly the artists who carved the figurines have shown in the clearest manner that they were intimately acquainted with women who presented a close anatomical resemblance to the existing Bushwomen, and the presumption is that these were women of their own race.

The supposed connexion between the Aurignacians and the Bushmen begins to acquire an appearance of probability, and we may proceed to consider the evidence which is afforded by the bodily remains of the Aurignacian men themselves.

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logical Museum of Berlin, which steadfastly refuses to restore it to the rightful owner (*L'Anthropologie*, xxiv, 1913, p. 734, and from personal communication with Dr. Lalanne).

[1] S. Reinach. "Statuette de femme nue découverte dans une des grottes de Menton," *L'Anthr.*, 1898, ix, p. 26.

[2] E. Piette, *L'Anthr.*, 1895, vi, p. 137. See also Moriz Hoernes, *Der Diluviale Mensch in Europa*, 1903, Brunswick.

The material at our disposal is sufficient to establish the existence of at least two different races which occupied the hunting grounds of Europe in Aurignacian

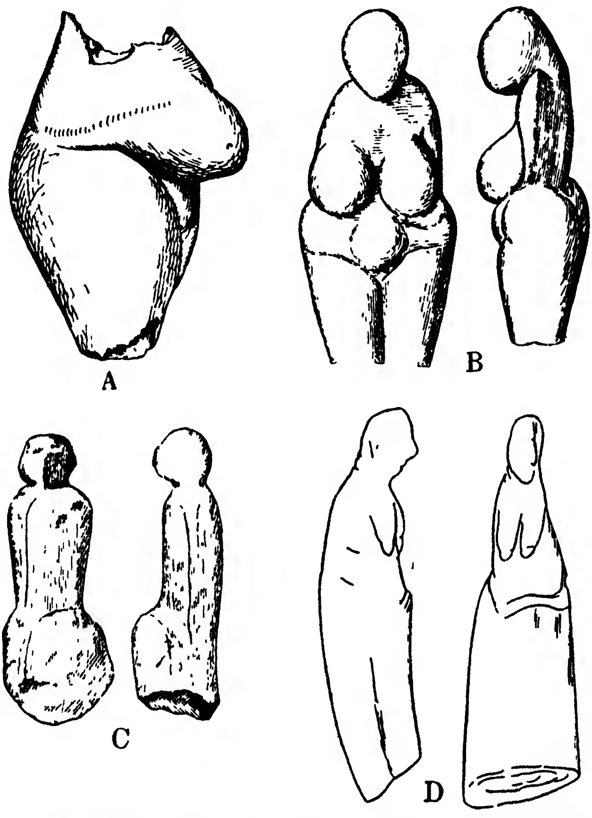

FIG. 242.—Aurignacian figurines, except D, which is Lower Magdalenian. A, la Vénus de Brassempouy, or "La poire," in ivory, from Brassempouy. (After Piette, *L'Anthr.* × $\frac{3}{5}$); B, statuette in steatite, from the Grotte du Pape. Mentone, 47 cm. in height (after Reinach, *L'Anthr.*); C, rough figure in reindeer's horn, from Pont-à-Lesse, Belgium (nat. size, after Dupont); D, buste de femme, carved from the incisor of a horse, Mas d'Azil (nat. size, after Piette, *L'Anthr.*).

times. One of them is represented by the giants of Crô-Magnon, the other by the little people of the so-called Grimaldi type.

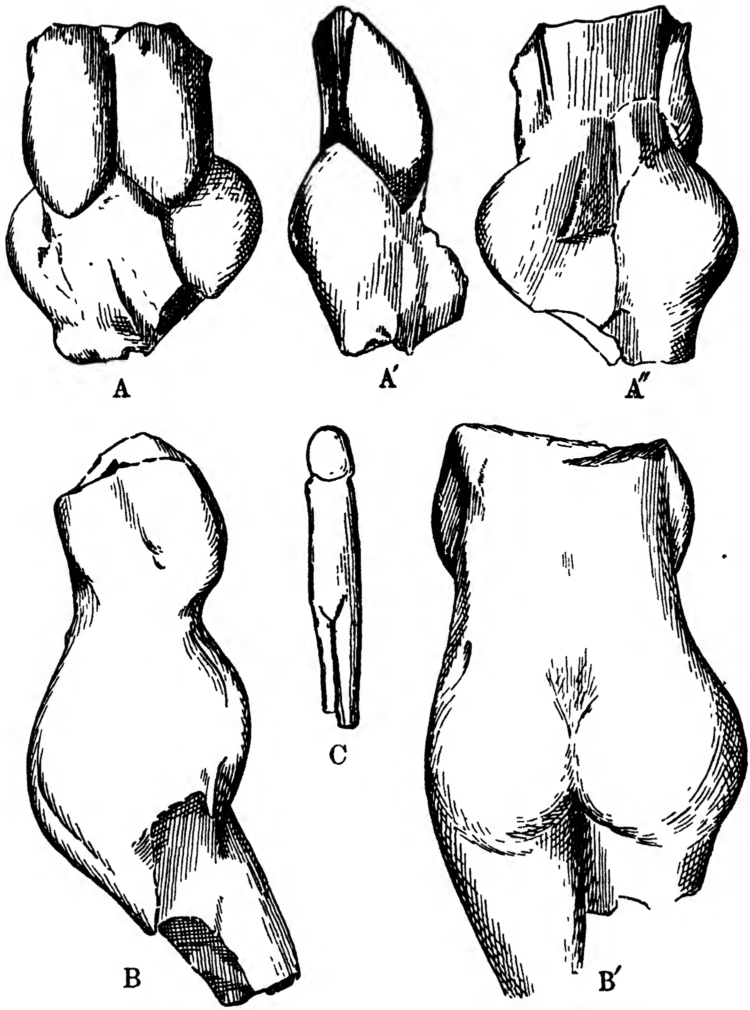

FIG. 243.—Aurignacian figurines. A, la manche du poignard; B, the Venus innominata; C, la fillette. All in ivory, from Brassempouy. (After Piette, *L'Anthr.* $\times \frac{5}{6}$.)

The Crô-Magnon race was the first to receive recognition and some of its most distinctive characters were determined by Broca [1] as long ago as 1868. Crô-

[1] Broca, " Sur les crânes et ossements des Eyzies," *Bull. Soc. d'Anthr. de Paris*, 1868, iii, p. 350, followed by a discussion in which Pruner Bey

Magnon [1] is the name of a rock shelter, near Les Eyzies, in the valley of the Vézère and the deposits which had accumulated on its floor were cut through in making a railway line from Limoges to Agen. In this way the skeletons were discovered on which Broca based his conclusions. One of the best preserved skulls which has long been known as the "old man of Crô-Magnon" ("le grand vieillard" of Broca) was made the subject of a prolonged controversy, for although it and other bones associated with it undoubtedly occurred in deposits of Aurignacian age, yet it evidently owed its position to an interment.

But it was a dogma sedulously inculcated by G. de Mortillet that interment was never practised before the Neolithic epoch, and the Crô-Magnon remains were therefore assigned to that period. How baseless this dogma really was has since been proved by numerous discoveries. We have already seen that even in Mousterian times man was accustomed to bury his dead, and that it was a common practice in the Aurignacian age is shown by the fact that nearly all the skeletons known certainly to date from that time have been found in graves which lay immediately beneath intact layers of cave earth or hearths containing an Aurignacian industry.[2]

Skeletons or parts of skeletons belonging to the Crô-Magnon race have now been found in Laugerie Haute [3] and Solutré in France, at Obercassel near Bonn, Brünn

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and M. Bertillon took part, pp. 416, 454, 554; see also A. de Quatrefages and E. T. Hamy, *Crania Ethnica*, Paris, 1882, p. 44 *et seq.*, and Pruner Bey, *Rel. Aquitanicæ*, 1875, p. 73.

[1] L. Lartet, "Une sépulture des troglodytes du Périgord," *Bull. Soc. d'Anthr.*, *tom. cit.*, p. 335.

[2] E. Cartailhac, *Les Grottes de Grimaldi*, 1906, ii, fasc. ii, p. 305.

[3] H. Klaatsch, "Die Aurignac-Rasse, etc.," *Zeits. f. Ethn.*, 1910, lii. p. 513 *et seq.*

in Moravia, and at Paviland in South Wales, for the famous "Red Lady" proves to have been a Crô-Magnon man.[1] But it is to the Grottes de Grimaldi at Mentone, situated within the limits of the Mediterranean province, that we must turn for our richest spoils. Of the numerous skeletons found there no less than five or six are well enough preserved for exact investigation and they have been described in a masterly manner by Dr. Verneau[2] in one of the volumes of that noble series of monographs for which Science is indebted to the generosity of the Prince of Monaco, to whom also the systematic exploration of the Mentone caves is due.

All the skeletons at Mentone were found under conditions which point to burial. In some cases the interment was made over a hearth—in one instance, both here, and at Solutré, while the embers of the fire were still glowing—in others in a grave, or again in a rudimentary tomb, made by placing flat stones on edge for the walls and roofing it over with larger slabs. The body was buried, possibly dressed in the clothes, certainly adorned with the ornaments, which had been worn during life; these include perforated shells of *Nassa neritea*, perforated teeth of deer, vertebræ of fish such as salmon, and carved pendants, representing together the remains of a necklace or collar. The perforated shells are sometimes found thickly incrusting the skull, and seem to have been sewn on to a cap. Precisely as at Paviland, a quantity of red ochre was buried with the body and now adheres to the bones. Flint implements of Aurignacian type are also found in the burial place.

[1] "Paviland Cave," *Journ. R. Anthr. Inst.*, 1913, xliii, p. 364 *et seq.*
[2] R. Verneau, *Les Grottes de Grimaldi*, ii, fasc. 1.

The bodily characters presented by all the skeletons of the Crô-Magnon race are of a very uniform kind. The stature ranged from 1·79 m. (about 5 feet 10 inches) to 1·94 m. (6 feet 4 inches), with a mean of 1·87 m. (about 6 feet).[1] The legs were longer in proportion to the arms than they are in existing races, and the lower leg was disproportionately long as compared with the thigh. The hands were proportionate to the stature,

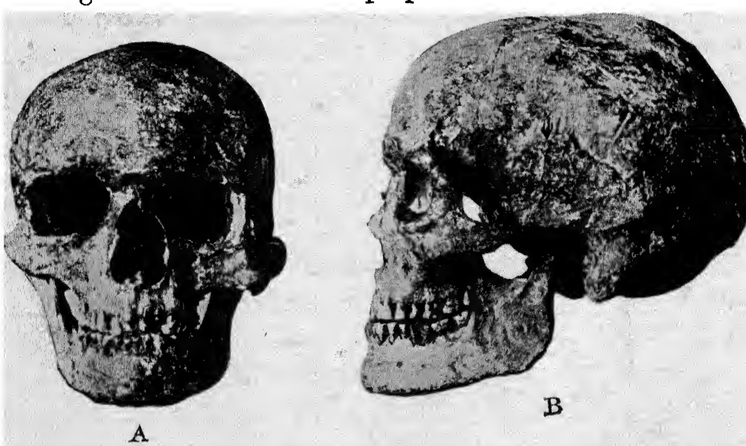


FIG. 244.—Skull of a Crô-Magnon man. From the Grotte des Enfants, Mentone. (After Verneau.)

but the fingers were shorter and the palm longer than in modern European hands of the same size. The cranial capacity was very great, ranging from 1590 to 1715 c.c. The head (Fig. 244) is dolichocephalic (index about 73); and thus not in harmony with the face, which is broad and short (index about 66); the glabella and brow ridges are well marked, the orbits rectangular and very deficient

[1] Dr. Verneau obtained this result by calculation from a formula employed by Prof. Manouvrier: on recalculating from Prof. Karl Pearson's formula I find a range of from 1·725 m. (5 feet 8 inches) to 1·842 m. (6 feet 2 inches) and a mean of 1·787 m. (5 feet 10 inches). By the formula employed by those who practise the art of journalism they have become 7 feet!

in height (index about 68); the nose is depressed at the root, but rises rapidly, and is long and narrow, or leptorhine (index about 50).

A race distinguished by tall stature, a short face, and depressed orbits was certainly not Bushman, and though it was regarded as Mongoloid by Pruner Bey it is difficult to determine its precise affinities to any existing people.[1]

To discover the second of the Aurignacian races we must return to the caves of Mentone. One of these,

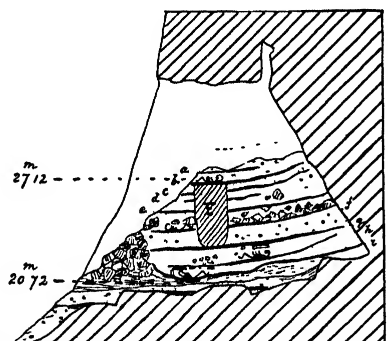
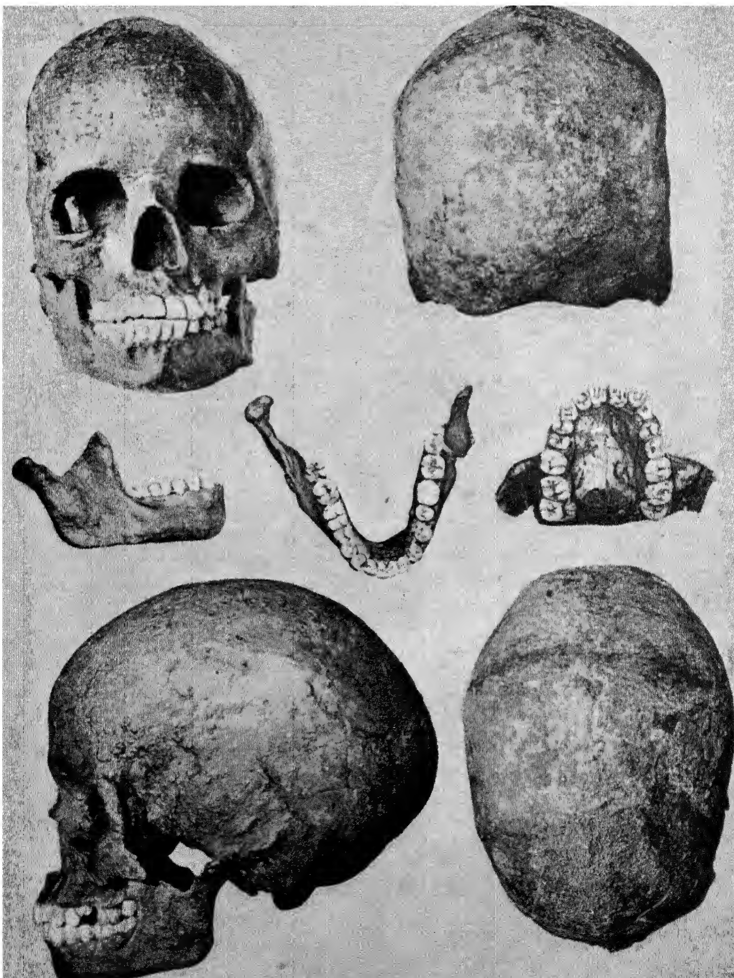


FIG. 245.—Section through the Grotte des Enfants, Mentone; *a*—*i*, successive hearths with charcoal and broken bones. The double interment was found in the layer *i*; F, a lime-kiln of late date. (After Boule.)

the Grotte des Enfants, has served at various times as a sepulchre; the corpses have not been inhumed but simply laid upon the floor as it existed at the time, and protected by blocks of stone. The earliest interment was that of an old woman and a youth not more than seventeen years of age—they represent the second or

[1] Prof. Boule calls attention to a close resemblance with the Guanches of the Canary Islands, which was first pointed out by Quatrefages and Hamy and subsequently confirmed by Verneau. *Les Hommes fossiles*, 2nd ed., p. 293. This view was also supported in an essay, otherwise very valuable for its criticism, by the late V. Giuffrida-Ruggeri, "Per una sistemazione del Tipo di Crô-Magnon," *Arch. l'Anthr. e la Etnologia*, xli, fasc. i, 1911.

Grimaldi race of Aurignacians; cave earth subsequently accumulated and covered them up, then followed another interment this time of a Crô-Magnon man;



[By kind permission of Prof. Boule.

Fig. 246.—Skull of the Aurignacian youth from the Grotte des Enfants, Mentone.

again other interments followed and a continual accumulation of the cave earth, so that when the skeletons of the woman and boy were discovered they lay nearly 8 metres (25 feet) below the surface of the ground (Fig. 245). They have been studied in great detail by Dr. Verneau.[1]

The skulls (Fig. 246) are dolichocephalic (index close on 69), the glabella is only slightly prominent, the

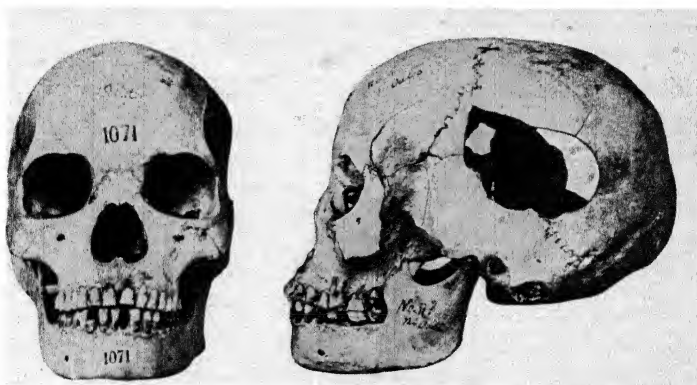


FIG. 247.—Skull of a Bushman for comparison with that of the Aurignacian youth. The similarity of the lower jaws is well shown; the difference in the form of the sinciput is equally obvious.

nose flat, with nasal gutters at the base (a character met with in some Australians and Negroes), the jaws prognathous, the chin slightly retreating, the palate parabolic in outline, the teeth large and Australoid in character. Dr. Verneau remarks that the lower limbs are extremely elongated as compared with the upper limbs, even more so than in Negroes. It may be added that the same is true of the Bushmen.[2] The height of

[1] R. Verneau, *tom. cit.*, p. 125 *et seq.*

[2] This will be seen from the following table:

	Ratio of the lower to the upper limbs.
In Europeans	1·435 : 1
,, Negroes	1·44 to 1·47 : 1
,, Bushmen	1·485 : 1
,, Mentone woman	1·532 : 1
,, ,, youth	1·575 : 1

the woman was about 1580 mm., of the boy about 1540 mm. The average height of the Bushmen is 1530 mm., with a range of from 1400 to 1650 mm.[1]

This interment proves, therefore, the existence of two individuals belonging to a Negroid race of low stature, and of sufficient consideration to receive a ceremonial burial. We may infer that they lived among friends, and most probably therefore with people of their own race. Steatopygous figurines found in adjacent caves at Mentone strengthen this conclusion, and the evidence that Mentone was inhabited at the beginning of the Aurignacian age by a race allied to the Bushmen amounts almost to positive proof. That this race extended over the south of France and the north of Spain is highly probable. It may even have reached Belgium, as is suggested by the puppet found at Pont-à-Lesse, or Austria, as is shown by the very Negroid-looking statuette from Willendorf.

We must be careful, however, not to identify the Grimaldi race too closely with the Bushmen. The cranial capacity of the youth found in the Grotte des Enfants is asserted on the high authority of Dr. Verneau to have been no less than 1580 c.c.[2] This is a very remarkable fact, since such a high capacity is not only far in excess of that of the Bushmen (1330 c.c., mean), but also of any existing Negro race.[3] The two skulls differ also in form, as will be seen on referring to the profiles in Figs. 246 and 247. The outline of the cranial vault of the Bushman presents a characteristic flattened

[1] Selous, however, gives the average height as 5 feet 4 inches (1625 mm.) and says he has seen some Bushmen of 5 feet 8 inches or even 6 feet; but he attributes these exceptions, no doubt rightly, to admixture of blood. Livingstone also asserts that he has seen Bushmen 6 feet in height.

[2] The cranial capacity of the old woman was 1375 c.c.

[3] Dr. Verneau remarks that a capacity of 1535 c.c. has been observed in an Aeta of Binganonan, and of 1310 c.c. in a woman of the same race, *tom. cit.*, p. 148.

summit, while that of the Aurignacian youth is well rounded, forming part of a great circular arc which extends from the top of the forehead to the occiput. In this particular there is indeed a closer resemblance between the Crô-Magnon skull and the Bushman.

However this may be, it is clear from the character of the human skeletons that Piette had happily divined the truth when he asserted that the features of the statuette point to the contemporaneous existence during Aurignacian times of at least two races in Europe, one of which was allied to the Bushmen; and a curious confirmation of this conclusion has been afforded lately by the imprints of the hands in the caves, for in some cases, as at Gargas, these are of small size and indicate a little people, belonging no doubt to the Grimaldi race, while in others, as in Castillo, they are large with short fingers and long palms, indicating a tall people, who were evidently the Crô-Magnons.

Of these two races, we find one still represented in South Africa; the other we shall meet with again in the Magdalenian age.

The Negroid race of pre-dynastic age which has left steatopygous figures of baked earthenware in the Thebaid may be distant relatives. Their nearer representatives, who retained most fully their culture, habits, and disposition, were the Bushmen as we first knew them.

The Bushmen thus acquire a very peculiar interest for us, and we may therefore conclude our study of the Aurignacians with a short account of them. This will form the subject of the next chapter. Unfortunately we have here once more to lament many deficiencies in our knowledge, a vast amount of precious information having been irretrievably lost owing to the indifference

of civilised Governments and of so-called civilised people to the history and welfare of the primitive races with which they have been brought into contact.

Before opening another chapter, however, we must take this opportunity of referring to one or two additional discoveries of Aurignacian skulls with Negroid affinities.

The Ossuary of Předmost (Moravia).—Near Předmost, at the foot of a steep and overhanging cliff, which provides an excellent shelter from the wind, is a vast accumulation of bones which for centuries has been dug into for manure. It is a valuable property. The bones represent a typical cold fauna, reindeer, elk, musk-ox, banded lemming, chamois, arctic hare, glutton, arctic fox and mammoth; bears, wolves and lions also. All around is the löss. The long bones of many of these animals are all broken and the skulls smashed in; many are charred, and there are whole heaps which have been reduced to charcoal.

This great pile is the hunters' kitchen-midden. Here in 1879 Dr. Wankel made an important discovery which led to further investigation by Prof. Maška[1] and M. Kříž; under a layer of Solutrean age, on an Aurignacian horizon, was found a tomb 4 m. long by 2·5 m. wide, bounded by stones and great bones and roofed in with stone slabs. It was filled with human skeletons, mostly in the contracted position, and of all ages from children to old men. There are the remains of twenty individuals, ten of them in excellent state of preservation, and most of them are set up in the Museum

[1] K. J. Maška, *Der Diluviale Mensch in Mähren*, Neutitschein, 1886, and *Mitth. K. K. Central Commission f. Kunst-und historische Denkmale*, xx, p. 129, 1894; and also M. Kříž, "Die Lösslager in Předmost bei Prerau," *Mitth. Anthr. Ges. Wien*, xxiv, 1894, p. 40; "Quatärzeit in Mähren," *op. cit.*, xxviii, 1898; and *Beiträge zur Kenntniss der Quatärzeit in Mähren*, Steinitz, 1903.

at Brünn. Although more than a quarter of a century has elapsed since their discovery they have not yet been fully described: from the preliminary account and illus-

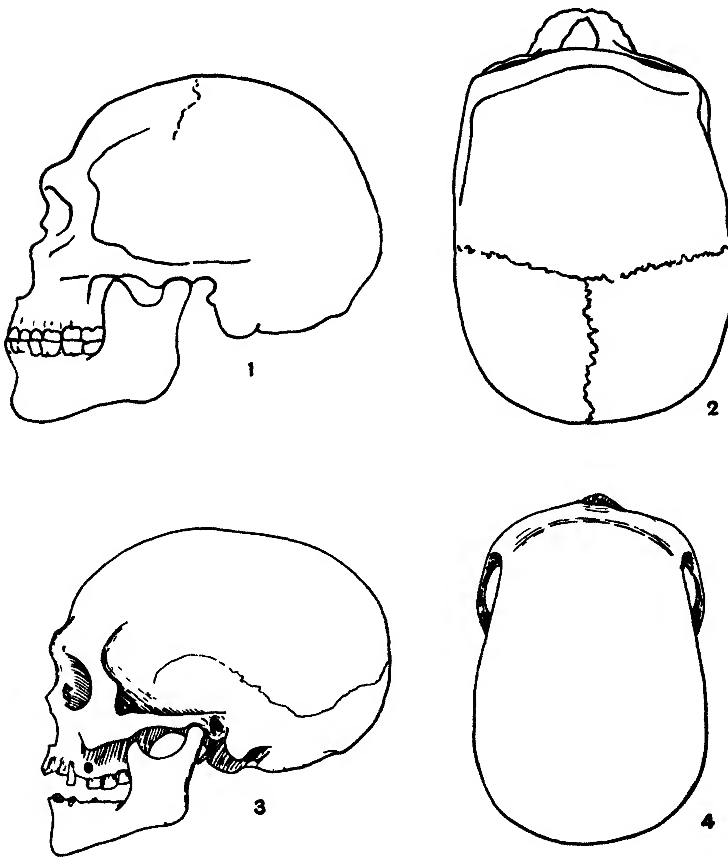


FIG. 248. 1 and 2, skull of a Predmost man seen in profile and from above (after Absolon); 3 and 4, skull of a male Korana seen in profile and from above, from Bayville, near Port Elizabeth (after Broom.)

trations given by Dr. Absolon[1] it would appear that they are related to some Negroid race, and they recall in some respects the Koranas of South Africa, particularly

[1] K. Absolon, in Klaatsch-Heiborn, *Der Werdegang der Menschheit*, Berlin, 1920.

that division of the race which Dr. Broom[1] has distinguished as the "Australoid" Koranas, on account of the frontal torus which characterizes the skull (Fig. 248). The face, however, is by no means Negroid.

In 1909 an enterprising Swiss, Dr. O. Hauser,[2] dis-

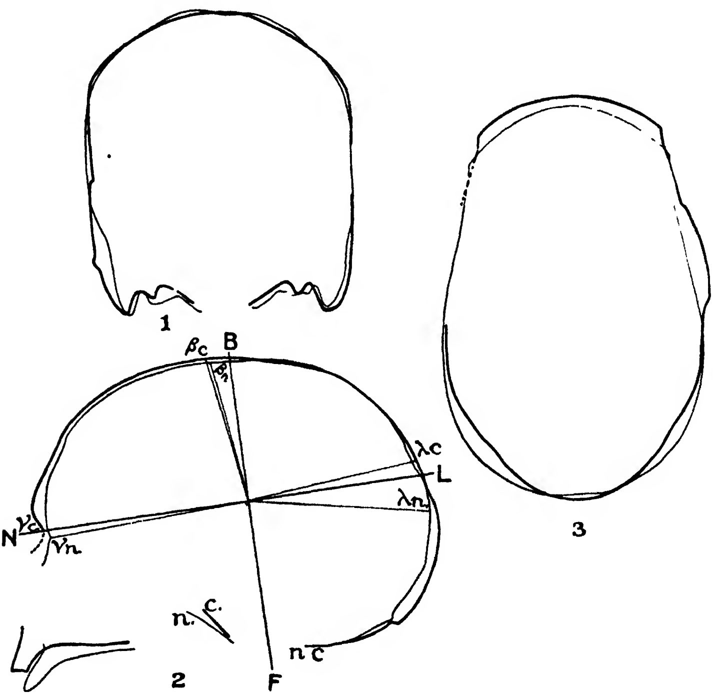


FIG. 249.—The skull of Combe Capelle (thick line) compared with that of a Negro from the West Coast of Africa; 1. Transverse sections; 2. Sagittal sections; 3. Horizontal sections.

covered in the cave of Combe Capelle (Perigord) a complete skeleton of an Aurignacian man. It was buried with similar adornments to those found with the

[1] R. Broom, "A Contribution to the Craniology of the Yellow-skinned Races of South Africa," *Journ. R. Anthr. Inst.*, vol. liii, 1923, pp. 132–149, 2 pls.

[2] H. Klaatsch and O. Hauser, "Homo Aurignaciensis-Hauseri," *Prähist. Zeits.*, i, p. 273, 1910.

Grimaldi skeletons, and near the left hand lay a beautifully worked boucher of Upper Acheulean age. The skeleton was described by Klaatsch [1] with the object of showing that it was not a Neandertalian and had no affinities with that race. He regarded it as closely allied to the Australians.

There seems to be little doubt, as was first pointed out by Giuffreda-Ruggeri,[2] that it is Ethiopian with some primitive characters. The skull is very dolichocephalic (index 65·7), even more so than most Negroes' skulls [3] which, however, it closely resembles in many other respects, as is shown by the illustrations in Fig. 249. The legs of the skeleton, like those of the Grimaldi race, are extremely elongated as compared with the arms, and the tibia is disproportionately long as compared with the femur. The height is given by Klaatsch as 1600 mm.

[1] H. Klaatsch, "Die Aurignac-Rasse, etc.," *Zeits. f. Ethn.*, xlii, p. 513, 1910.
[2] V. Giuffrida-Ruggeri, *Su l'origine dell' Uomo,* 1921.
[3] Dr. Broom gives 64·2 for one Korana skull and 64·1 for a Hottentot.

CHAPTER IX

THE BUSHMEN [1]

THE physical features of the Bushmen may be gathered from the accompanying photographs (Figs. 250 and 251), which I owe to the kindness of Prof. Haddon.

[1] The most comprehensive work we possess on the Bushmen is by G. W. Stow, *The Native Races of South Africa*, London, 1905. Unfortunately, it does not give the literature of the subject. Some of the more important sources of information are, A. Sparrmann, *A Voyage to the Cape of Good Hope* (1772–6), English translation, London, 1785; John Barrow, *Travels into the Interior of South Africa*, London, 1806; H, Lichtenstein, *Travels in South Africa*, English translation, London, 1815, two vols. The statements in this work are sometimes so inaccurate that I cannot think they are based in all cases on direct observation. W. J. Burchell, *Travels in the Interior of South Africa* (1816), London, i, 1822; vol. ii, 1824. Burchell's descriptions are worthy of his great reputation as an exact and unbiassed observer. T. Arbousset and F. Daumas, *Relation d'un Voyage d'Exploration au nord-est de la Colonie du Cap de Bonne Espérance* (1836), Paris, 1842. This is a veritable mine of facts. G. Fritsch, *Die Eingeborenen Südafrikas*, Breslau, 1872. A good account is given on pp. 383–447, with pl. L in Text, and pls. xxvi–xxx, in Atlas. T. Hahn, "Die Buschmänner," *Globus*, 1870. This I have not seen. A graphic and at the same time scientific account of the last poverty-stricken remnants of the race is given by S. Passarge, *Die Buschmänner der Kalahari*, Berlin, 1907. W. H. I. Bleek, *A Brief Account of Bushman Folklore and other Texts*, London, 1875. G. M. Theal, *History and Ethnography of Africa, South of the Zambesi*, London, 1907, i. This is a compilation written in a disparaging spirit. S. S. Dornan, "Notes on the Bushmen of Basutoland," *Trans. South Afr. Phil. Soc.*, 1909, xviii, pp. 437–450. Scattered references will be found in Kolbe, *The Present State of the Cape of Good Hope*, London, 1731 (trans.); J. Campbell, *Travels in South Africa*, 1815, *ibid.*, *Second Journey*, 1822 (not of much value); H. H. Methuen, *Life in the Wilderness*, London, 1846, pp. 82–85; D. Livingstone, *Missionary Travels and Researches in South Africa*, London, 1857, p. 165; T. Baines, *Explorations in South-West Africa*, London, 1864; J. Mackenzie, *Ten Years North of the Orange River*, Edinburgh, 1871, cap. viii; A. A. Anderson, *Twenty-five Years in a Waggon*, 1887, i. Many interesting facts will be found in the *Records of the Cape Colony*, edited by G. M. Theal. J. T. Bent, *The Ruined Cities of Mashonaland*, London, 1892; F. C. Selous, *Travels and Adventures in South-East Africa*, London, 1893, pp. 328–348; and C. Warren, *On the Veldt in the 'Seventies*, London, 1902.

The habit of the hair to grow curled in pellet-like tufts is well shown in Fig. 251.

The skin of the Bushman is yellow to yellowish-brown in colour, but in some groups, according to Burchell, it is no darker than in some of the brunettes of Europe. It does not emit the same peculiar odour as the skin of the Negro races, which is as unpleasant to us as ours to them. The thigh bones are bowed outwards to a remarkable degree, a peculiarity which Burchell attributes to the unusual size of the trochanter major. Every traveller speaks with admiration of their small and elegantly shaped hands and feet.

FIG. 250.—Bushman from the Kalahari desert. (After a photograph in the possession of Prof. Haddon.)

Although far from attaining to our standard of beauty, yet still there was something prepossessing about the Bushman to those who looked with a discerning eye; thus Burchell wrote, "The beautiful symmetrical form of our Bushman guide, who walked and sometimes ran before us with a gait the most free and easy I have ever beheld, his well-proportioned, although small and delicate figure, his upright and manly port, his firm, bold steps, and the consciousness of liberty which beamed in his countenance, afforded us indescribable pleasure."

The Bushman was pre-eminently a hunter. His hunting-ground, which up to the time of the advent of the white man included a large part of South Africa,

abounded in game: gemsbocks, gnus, elands, antelopes, giraffes, bison, elephants, rhinoceroses, quaggas, zebras, ostriches, and the wild boar afforded him a rich booty. The weapon he depended on most, both in the chase and war, was the bow and arrow: the bow usually short and the arrows small, but deadly in their effect, since they were invariably poisoned. Different kinds of

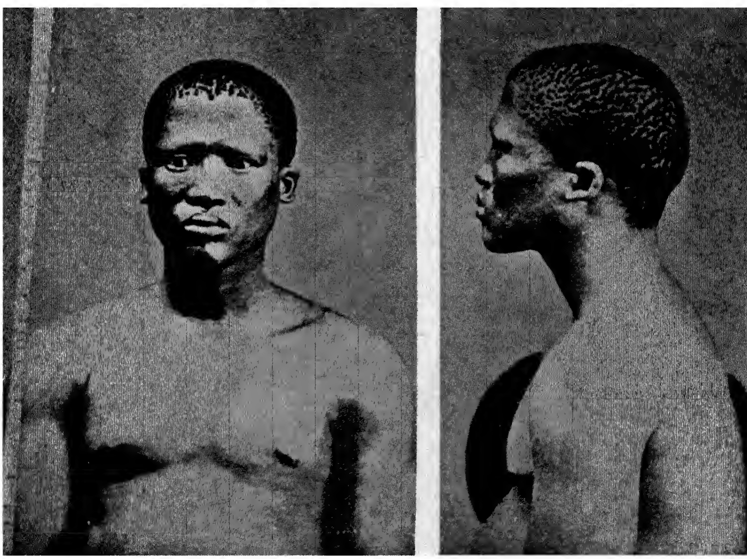


Fig. 251.—A Bushman from the Kalahari desert. (After a photograph in the possession of Prof. Haddon.)

poison were used, some stronger, some weaker, according to the size and vitality of the intended victim. In all of them the poisonous juice of some plant, Amaryllis (*A. toxicaria*), or Euphorbia, or Strophanthus, thickened by evaporation in the sun, furnished a solvent or menstruum to which more violent animal poisons were added; scorpions and centipedes ground up into powder were the distinctive ingredients of one kind;

another contained snake poison; another was prepared from the trap-door spider, a creature of such venom that its bite is said to kill a frog in less than a minute; but the most fatal of all was obtained from the N'gwa, a little caterpillar about half an inch in length, the entrails

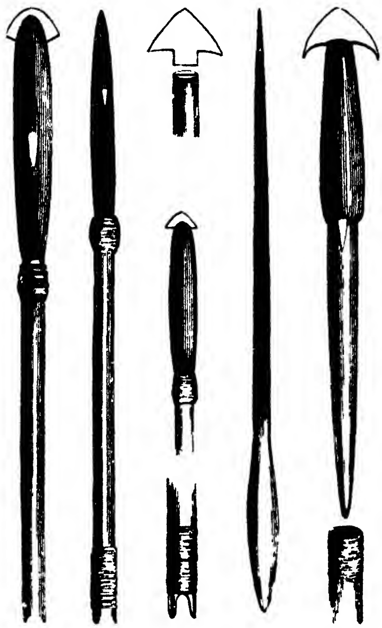
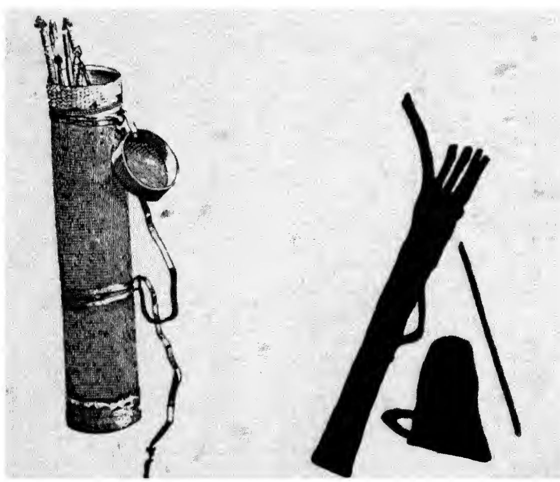


FIG. 252.—Bushman's arrows. 1, 2, 3, from Namaqualand; 4, 5, from the Middelveld, Cape Colony. 1. The front end of the shaft and a bone head tipped with iron. 2. Similar, but without the iron point: both 1 and 2 show the barb. 3. Below, the notched end of the shaft; in the middle, the head; and above, the iron point separated from the bone head to show how it is affixed. 4. A bone head, the sharpened end of which forms the point; the poison is smeared over the finely-tapering extremity. 5. The head separated from the shaft to show how it is inserted. (After Burchell.)

of which furnished a poison so rapid in action that it was employed in hunting the lion. The strength of these preparations is said, however, to vary very considerably;[1]

[1] Passarge, *op. cit.*, p. 67.

sometimes, like wines, with the year; sometimes with the weather. The poison, when ready for use, resembled a mass of brown or black wax. It was carried in a skin pouch and applied to the arrow with a brush, or by means of a poison-stone, a smooth flat pebble with a deep groove down the middle to hold the poison. This stone was one of the most precious possessions of the



1 2

FIG. 253.—1. Bushman's quiver. (After Sparrman.) 2. Mural painting of a quiver, a basket inverted, and a stick from Cucua Saltadora, Carca, Spain. (After Obermaier and Wernert.)[1]

Bushman; it is said he would die rather than part with it. The shaft of the arrow was a slender reed (Fig. 252) about a foot long, notched, but not feathered, and neatly bound round with sinew at each end, to prevent it from splitting; it was provided with a bone head, about six inches in length, to give it weight. This was made out of the leg bone of an ostrich or

[1] H. Obermaier and Paul Wernert, "Las Pinturas rupestres del Barranco de Valltorba (Castellon)" *Com. de Invest. Pal. y Prehist.*, Memoir No. 23, Madrid, 1919. Fig. 63.

giraffe; the bone was broken up by hammering it with a sharp stone and the splinters thus obtained were first scraped into shape with a stone spokeshave and then ground straight and smooth by a grooved piece of sandstone. In rare cases the head was made of ivory. The head was made just to fit the shaft, but not fixed in, so that after a successful shot it would remain rankling in the wound while the shaft dropped off. A strip of quill was attached as a barb, and as far down as this the head was carefully covered with poison.

The point of the arrow might be merely the sharpened end of the bone head which, in this case, was carried, until required for use, stuck point downwards in the shaft; but more usually the point was a separate piece, such as a flake of quartz, chalcedony, or other hard stone; or, in later times, bottle glass or a sharp triangular blade of iron, obtained by barter from neighbouring tribes. In this case the bone head was squared at the end, and cut into a notch or groove to receive the point, which was cemented in with resin, or gum.

The arrows were carried in a quiver (Fig. 253), furnished with a lid to prevent accidents, though a self-inflicted wound usually caused no more than a passing inconvenience, since the hunters were acquainted with appropriate antidotes; one of these was prepared from the tuber of a plant, the 'Kalahétlué, which grows wherever the poison grub 'Tha is found.[1] They also possessed antidotes of sufficient efficacy to protect them even against snake bites.

Armed with bow and arrows, the Bushmen laid the whole animal world under contribution, and defended

[1] Livingstone says that in the case of wounds poisoned by the N'gwa, the caterpillar itself mixed with grease was rubbed in as an antidote. Here we seem to have an anticipation of the principle of the Pasteur treatment.

themselves from their foes, whether lion or Kaffir, with equal courage and success. In approaching their quarry they were practised in all kinds of cunning. Disguise was a common device; sometimes with a bundle of grass tied on over the head they would glide by fits and starts through the grass so imperceptibly that the feeding herd had no suspicion of their presence. In stalking the wary quagga, which feeds in friendly company with the ostrich, the hunter disguised himself as one of these birds, simulated its gait, stopping every now and again to preen his feathers, or to peck and feed, till he found himself mingling with the herd, and could let fly his poisoned arrows without exciting suspicion. Although, under these circumstances, he could have made a heavy bag, he never took more than he really wanted, for he was a provident hunter, and killed for food, not for sport. For large game the Bushmen combined together to set traps, digging with great labour carefully concealed pitfalls, or suspending a heavily weighted weapon over the path to the water pools.

The pursuit of large game was the occupation of the men, but there was also a chase of small game, and this, as well as the collection of vegetable food, was the work of the women. No one who has travelled over the Karoo can have seen without surprise the monstrous ant-hills which disturb the regularity of the plain: the "eggs" of the ants, or more properly termites, known to the white man as Bushmen's rice, were a food they could fall back upon when other resources failed. Provided with a digging-stick—that is, a stick pointed at one end and weighted by a perforated stone just above the middle (Fig. 254)—the women would unearth large quantities of these "eggs." When sufficient had

been obtained, they were cleaned by sifting away the accompanying sand, and then, with the addition of a little fat, roasted over a fire, until they turned a nice brown. Cooked in this way they are said to have been delicious eating.

Locusts were a favourite dish, and the swarms of these great insects which darken the air in their flight [1] were looked forward to as bringing a time of plenty. They were not only eaten fresh, but preserved for hard times by drying and pounding up into a powder. This was boiled into a sort of porridge, or mixed with honey and made into a cake; in the latter form it was appreciated even by Europeans. Frogs and serpents [2] were dainty eating: poisonous serpents were decapitated before being cooked; their flesh has the flavour of chicken.

FIG. 254.—The Bushwoman's 'kibi or digging-stick. (After Ratzel.)

The vegetable kingdom was ransacked for all that it could afford, even the seeds of wild grasses were collected and stored for winter use.[3] How short a step it seems from this to agriculture; but to take this step requires qualities that the Bushman never possessed and inconsistent with his unconquerable love of a wild

[1] I once mistook them for smoke pouring in black clouds from a forest supposed to be on fire.

[2] "For these troglodyte Ethiopians are the most swift-footed of men . . . and they feed on snakes, lizards and similar creeping things."—Herodotus, lib. iv, cap. 183. "Lizards, locusts, grasshoppers, serpents."—Stow, *op. cit.*

[3] Since it is the women of primitive hunting tribes who collect and store the seeds, is it not possible that it was also a woman who was the

life. A kind of bread was made out of the pithy interior of Zamias, or of the root of *Testudinaria elephas*. In summer, when water is more than usually scarce, the Bushmen satisfy their thirst with the acid juice of melons, which grow plentifully, even in the desert, at that season; but if water is to be found they may be trusted to find it. In some cases they are driven to obtain it from wet sand, and this they do by means of an ingenious filter-pump; a hollow reed is wrapped round with a tuft of grass at one end (Fig. 255 B);

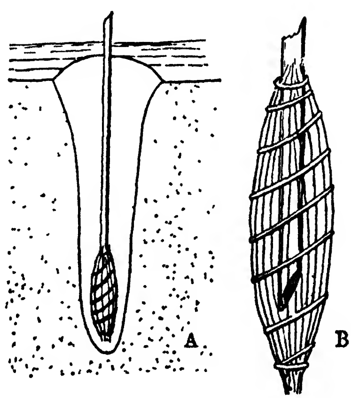


FIG. 255.—The lower end of the Bushman filter-pump. The end of the reed is supposed to be seen through the grass. (After Passarge.)

this is inserted into a hole made in the sand (Fig. 255 A) and the water sucked out. But the process is slow and laborious, and it is often with bleeding lips that the Bushman thus provides for his suffering wife and family. Water was—and perhaps still is—carried in ostrich eggs sometimes elaborately adorned with incised lines, sometimes engraved with figures of animals (giraffes, gnus, zebras, elands) and hunting scenes, or in

first agriculturist? For an affirmative answer, see Schurz, *Urgeschichte der Kultur*, Leipzig, 1900, p. 232, and E. Hahn, *Das Alter der Menschlichen Kultur*, Heidelberg, 1905, p. 31.

part of the intestines of a zebra or the paunch of a gnu. It is pleasant to find that these hardy hunters were not unacquainted with cheerful stimulants; they brewed an excellent mead from wild honey, and for tobacco they substituted hemp, which is said to be potent smoking (Fig. 256). The honey was obtained by robbing the wild bees, often with the assistance of the bee-cuckoo who was in the habit of betraying the nest, in the well-founded expectation that the Bushman, who always dealt honourably both with friends and foes, would reward him with a share in the booty. After a good day's

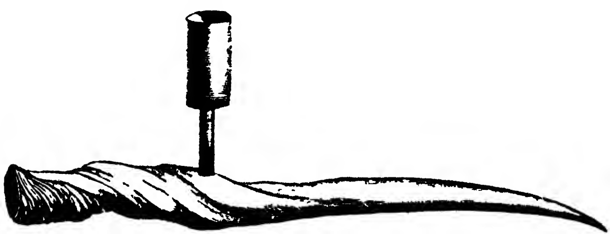


Fig. 256.—A Bushman's pipe. (After Sparrman.)

sport they held a feast and spent the rest of the evening in dancing and singing.

The Bushmen carried their love of art into every department of life. We have already admired their paintings,[1] but, like the Aurignacians, they also engraved

[1] There is a fair amount of literature on the subject. I take this opportunity to give here some additional references: J. Barrow, *op. cit.*, pp. 193, 269; G. Fritsch, *op. cit.*, and "Buschmann-Zeichnungen," *Zeits. f. Ethn.*, 1878, x, p. 15; A. A. Anderson, *op. cit.*, vol. i, pl. opposite p. 196, and frontispiece to vol. ii; Bartels, "Copien von Felsenzeichnungen der Buschmänner," *Zeits. f. Ethn.*, 1892, xxiv, p. 26; F. von Luschan, "Ueber Buschmanner-Malerei in dem Drakensberg," *Zeits. f. Ethn.*, 1908, xl, p. 665, pls.; C. G. Buttner, "Malerei in Damaraland," *Zeits. f. Ethn.*, 1878, x, p. 15; A. J. C. Molyneux, "Notes on some Rock Paintings in the Tuli District," *Proc. Rhodesia Sci. As.*, 1900, i, pp. 7–9, pls.; F. W. Girdler Brown, "Rock Paintings at Jahenda," *Proc. Rhodesia Sci. As.*, 1903–4, iv, pp. 86–87; Franklin White, "Some Rock Paintings and Stone Implements, World's View, Matopos," *Proc. Rhodesia Sci. As.*, 1905, v; Schloeman, "Felsenzeichnungen der Buschmänner bei

animal figures on the rocks, not, however, by incised lines, but by punching holes, so that the resulting line was "dotted."[1] A case has been recorded, however, of an antelope graven in relief, and another actually drawn with incised lines,[2] and still more recently important discoveries have been made of deeply incised designs, which have been finished by punching out the surface included within the outline, so as to produce a kind of intaglio. One of these (Fig. 257, 1) representing an elephant on the march is a perfect triumph of realistic art; every feature is faithfully reproduced, and by the rendering of the limbs, especially by the backward bend of the off forefoot and the thrown out hind leg, the swinging gait has been so successfully caught that we seem to see the great animal actually walking. The giraffe (Fig. 257, 3) belongs to the same series. Whether these sculptures were painted or not Dr. Peringuey[3] does not tell us, but engravings are known which were certainly completed in that way just as they were in Altamira and elsewhere. Especial attention may be called to the successful attempt at foreshortening in the figure of the rhebok (Fig. 257, 2).

Pusompe in Nord-Transvaal, etc.," *Zeits. f. Ethn.*, 1896, xxviii, p. 220; M. Helen Tongue, *Bushman Paintings*, with a preface by H. Balfour and notes by E. D. Bleek, Oxford, 1909; O. Moszeik, *Die Malereien der Buschmanner in Süd-Afrika*, Berlin, 1910; J. P. Johnson, *Geological and Archæological Notes, Orangia*, London, 1910, pp. 70–90; S. S. Dornan, *op. cit.*, pp. 439, 445–7; A. Schweiger, "Neuentdeckte Buschmannmalereien in der Cape-province, Si dost-Afrika," *Anthropos*, 1913, viii, pp. 652–669, 1010–1025; pls.

[1] I shall not readily forget the surprise with which I came upon the figure of an antelope outlined on the surface of a *roche moutonnée* which was glaciated during the upper Carboniferous epoch; this was near Riverton, on the Vaal; Stow mentions a finely sculptured eland in the same locality.

[2] L. Peringuey, "On Rock-Engravings of Animals and the Human Form, etc.," *Trans. South African Phil. Soc.*, 1906, xvi, p. 401. It may be noted that some of the Aurignacian drawings are *pointillés*.

[3] L. Peringuey, "Rock Engravings of Animals and the Human Figure found in South Africa," *op. cit.*, 1909, xviii, pp. 401–419, pls.

It has been asserted that the Bushman painters and the Bushman sculptors belonged to different branches of the race, but this is open to doubt.

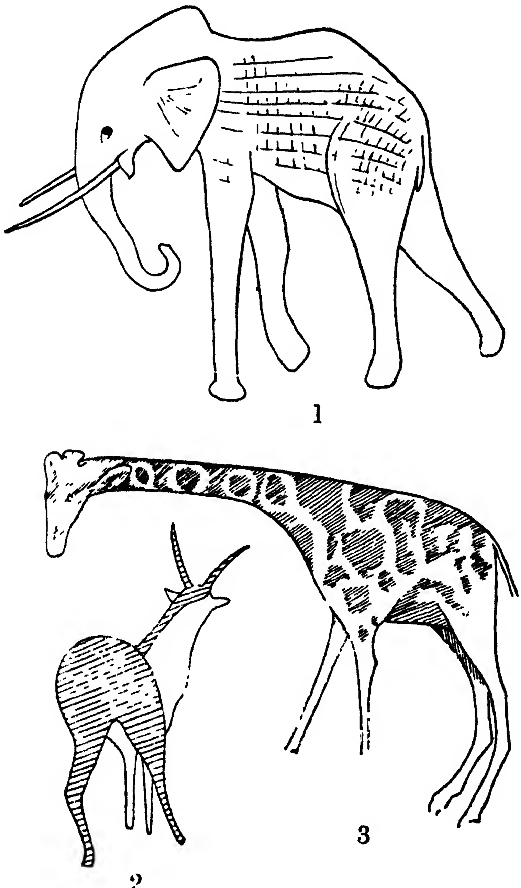


Fig. 257.—Elephant sculptured in sunk relief, from South Africa. (After Peringuey, and a plaster cast. × $\frac{1}{10}$ about.) 2. Fore-shortened figure of a rhebok, painted in yellow (oblique lines) and white. From Willow Grove, Cape Colony. (After Tongue. × $\frac{1}{3}$.) 3. A giraffe from South Africa. (After Peringuey. × $\frac{1}{8}$ about.)

Their dress, though scanty, was well adapted to their roaming habits, and not altogether without its elegances.

Around the waist they wore a girdle from which was suspended a scarcely adequate little apron in front and an appendage, known as the jackal's tail, behind. The woman's apron was made of threads or strings of beads and sometimes hung down to her feet. A caross or short mantle of springbok's fur, cut and ornamented in different fashions, was worn over the shoulder. At night when the Bushman curled up in his little nest to sleep this covered him like a blanket. Great care was expended on the preparation of the caross; the skin

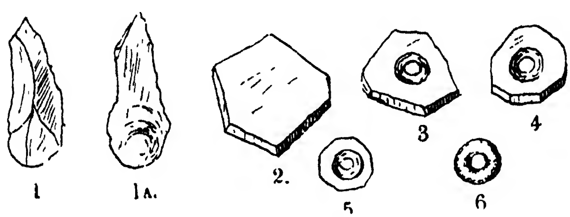


FIG. 258.—Stages in the manufacture of Bushman's beads. 1, 1A. The flint borer. 2. Angular fragment of shell. 3, 4, 5. Intermediate stages leading to 6, the finished bead.

was first cleaned of all fat and superfluous material by scraping with a flint implement, it was then rendered soft and supple by stretching, rubbing between the hands and trampling with the feet. They had skin or fur caps, mostly worn by the men, but sometimes also by the women,[1] which differed in form with the taste of the wearer, but on the whole were not unlike a helmet [2] or an Egyptian fez.[3] When out walking they wore light leather shoes or sandals. Both sexes adorned themselves with beads made from fragments of ostrich-shell; the shell was broken into little angular pieces, a hole was drilled in each piece with a flint borer, and then the corners were rounded off and the edges smoothed away (Fig. 258). Necklaces of these white

[1] Barrow, *op. cit.*, i, p. 233. [2] Barrow, *loc. cit.* [3] Stow, *op. cit.*

beads look well against the warm tint of the skin. A pretty effect was obtained by stringing little discs of dark leather alternately with the white beads. Certain districts possessed a reputation for making these beads, which were a regular article of commerce.

For social gatherings they made an elaborate toilet; the women sprinkled their head and neck with a green powder obtained from copper ore, and dusted glittering scales of mica or threads of asbestos over their hair, after dressing it with a red ochre pomade. The men painted themselves with red, yellow, or black, in various designs, such as chevrons, diagonal bands, zebra-like stripes, etc., after much the same fashion as the Australians; and they put on their anklets, bearing leather capsules with little pebbles inside—the Bushman bells—which made a rattling noise in the dance. For some dances they wore large ball-shaped rattles also, which were fixed to their shoulders; these were jerked at the proper intervals to punctuate the time. The women were fond of perfumes and used to carry a bag of aromatic powder about with them.

In some districts the Bushmen lived in huts (Fig. 259), in others, in caves, which they regarded in a real sense as their home. Dornan, writing of these caves in Basutoland, says they were the rallying points of the various clans, to which, however far they might wander away, they invariably returned, bringing back lively tales of their hunting exploits.[1] Stow was informed by several old Bushmen that all the great caves, *i.e.*, those inhabited by the head chiefs, were distinguished by paintings, which represented the tribal emblem, such as the eland, hippopotamus, ostrich and other animals.[2]

[1] S. S. Dornan, "Notes on the Bushmen of Basuto Land," *Trans. S. African Phil. Soc.*, 1909, xviii, pp. 437–450.
[2] Stow, *op. cit.*, p. 33.

Their huts (Fig. 259), light, simple, and portable, were well adapted to a hunter's mode of life. A few bent sticks formed the framework, which was covered with mats made of reeds laid side by side and neatly sewn together. The whole structure, which was as much a tent as a hut, was hemispherical in shape, about four

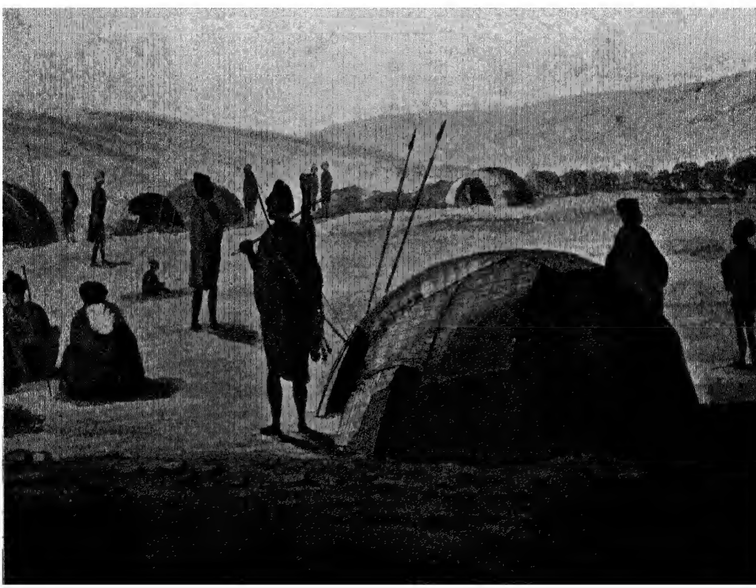


FIG. 259.—Part of a Bushman's kraal in the Middelveld, showing huts; in the middle of the foreground a hunter returning with a young antelope thrown over his shoulder; he is dressed in a caross, and carries his bow and quiver. Two assegais are seen stuck up against the foremost hut, their usual position when not in use. Several of the figures are seen with characteristic hats. (After Burchell.)

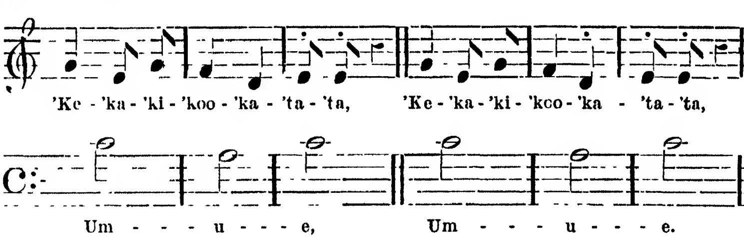
feet in diameter and only three feet in height, but to compensate for this the ground within was excavated into a kind of nest. Opportunity for adornment was found even here, for the mats were painted with broad stripes of red ochre.

The Bushmen were intensely fond of music,[1] and had made greater advances in this art than any of the other races of South Africa; appropriate music and song accompanied each of their numerous dances. Of their musical instruments, which included a reed pipe and drums, especial mention may be made of the four-stringed harp which had been evolved out of the bow, and of a combination of twelve bows which formed a primitive dulcimer.

The dance [2] afforded the Bushman an opportunity for

[1] Passarge has also remarked upon this, and contrasts the rich melodious voices of the Bushmen with the harsh and discordant voices of the Kaffirs. It is very pleasant, he says, to listen to the slow, sad songs of the Bushwomen, singing over their work.

[2] The best account is by Stow, pp. 111–120; on pp. 103–106 is some additional information from which I abstract the following. It is an account of Stow's interview with an old Bushman and his wife, the last survivors of an extirpated clan, who still lingered on in the mountain wilds. The old man had with him his bow and arrows, and was proud to show his skill in working with his bone awl and other implements; his wife was very intelligent and evidently well versed in the folk-lore of her people. On being shown copies of some cave paintings, they expressed great delight, explaining what they saw, and dwelling upon them as "our paintings," "our own paintings," "the paintings of our nation." They came to a copy of a dance picture, and the old lady at once exclaimed: "That! *that* is a grand dance! It is the 'Ko-'ku-curra!" She said it had gone out of fashion when she was a little girl, but was danced in the days of her grandmother's grandmother. "I know it!" she exclaimed, "I know the song!" and then swaying to the tune, sang the upper line given below:—



At this the old man was deeply moved, and kept touching her arm, saying. "Don't! Don't!" As she continued, he said: "Don't sing those old songs, I can't bear it! It makes my heart too sad!" She still persisted, warming with recollection of the past, until at last the old man himself could no longer resist, and accompanied her as shown in the lower line. Afterwards she gave the names and music to other dance pictures.

a combination of musical and histrionic powers which was precisely suited to his genius. Hence we find him passionately addicted to this art, which he had developed into a great variety of forms full of easy and graceful movements. Many of the dances might well be termed ballets, the performers, dressed to take the part, mimicked the life and habits of their friends, the animals; thus there was an amusing dance of the baboons, another of the frogs and a very poetical one of the bees. There was also a general masquerade in which each performer represented a different kind of animal. To another class belonged the hunting dances, and those associated with productive rites. One of the latter was a reed or pipe dance, and, to judge from the description, the sound of its fluting must have been pleasant to the ears of the great god Pan.

According to Burchell their revelry was well conducted; there was no rude laughter, no drunken jokes nor noisy talk.

The folk-lore of the Bushmen is not unworthy of their art. Bleek,[1] to whom we are indebted for rescuing much of it from oblivion, asserts that it is rich and varied. What he has recorded makes 6,600 columns of MSS. and fills 77 quarto volumes. We look forward to Miss Lloyd's forthcoming work on the subject for a full account of this. Bleek has scarcely published more than the headings, from which we select a few as examples:—Names of the Stars and Constellations; Prayers to the Sun, Moon and Stars; Bushman Rites when Canopus and his grandmother Sirius appear; Myth of the Dawn's Heart (Jupiter); The Origin of Death; The Lion Jealous of the Voice of the Ostrich[2];

[1] W. H. I. Bleek, *A Brief Account of the Bushman Folk-Lore and other Texts*, London, 1875, 20 pp. folio.

[2] Livingstone tells us that the ostrich roars so like the lion as to deceive anyone but a native.

The Jackal's Tower; The Anteater and his Musical Pet; The Lynx; Bushman Doctor and Sorcerer; A Primitive Race that Preceded the Bushmen; Men Turned into Stars, Statues and Trees by the glance of a Maiden; The Cat's Song (a poem); The Return Home (a poem). Many hunting stories are included; of one the headings run as follows:—A man accidentally wounded by another; the wounded man begs the others to speak gently and not angrily to the one who has shot him; the dying man's last speech to his wife; the widow's lament; an old man's speech on the faithfulness of woman and her husband's trust. Bleek's material also includes a map of the country inhabited by the Flat Bushmen, drawn by one of them, and genealogies of his Bushman informants; some of these extend back for five generations, and one includes more than 250 names.

Great effect is given to the animal stories by making each kind of animal speak its own language; this is accomplished by systematically transmuting some of the sounds of the Bushman tongue, generally the characteristic clicks, which are changed into more familiar consonants; thus, in the Tortoise's language, the clicks are turned into labials, in the Ichneumon's into palatals, dentals and sibilants. The language of the Blue Crane is made by ending the first syllable of almost every word by a double *t*. Here we may mention, by the way, that Passarge cites one old Bushman who professed to be able to understand the language of the baboons.[1]

Some of the Bushmen's stories have been published in full; we must content ourselves with a single example;

[1] Dr. Carpenter, who while in Africa kept under observation two pet monkeys (Cercopithecus), paid great attention to their "speech." He learnt to recognise thirteen distinct and different sounds and to attach a definite meaning to each; most of them were expressions of emotion, but not all; one indicated recognition; another was a cry for help, and a third, the most distinct, a hunting call. G. D. H. Carpenter, *A Naturalist on Lake Victoria*, London. 1920, p. 131.

it was obtained by Mr. J. M. Orpen from the same Qing whom we shall meet with later expounding a mythological picture (p. 482), and it explains how the baboons came to have tails. " 'Kaang sent Cogaz to cut sticks to make bows. When Cogaz came to the bush the baboons (who then were men (?)) caught him. They called on all the other baboons to gather round, and asked who had sent him there. He told them his father had sent him to cut sticks to make bows. 'Ah!' said they, 'your father thinks himself cleverer than we are, he wants the bows to kill us with, so we will kill you.' Then they killed Cogaz, and tied him up to the top of a tree, and they danced round it, singing, ''Kaang thinks himself clever.' 'Kaang was asleep at the time, but when he awoke he found out by his magic what had happened, so he went to the baboons. When they saw him coming they left off singing ''Kaang thinks himself clever,' and sang another song. But a little baboon girl said, 'Don't sing it that way, sing the way you were singing before,' and 'Kaang said, 'Sing as the little girl wishes.' So they sang and danced as before. 'Ah!' said 'Kaang, 'that is the song I heard, that is what I wanted, go on dancing till I return.' Then he went and fetched a bag full of pegs, and went behind each one and drove

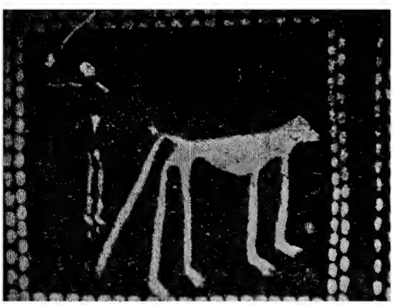


FIG. 260.—Recent Bushman painting on the outside of a hut. This appears to represent 'Kaang thwacking a baboon's tail with a stick. (After Alice Werner.)

a peg into each one's back and gave it a crack and sent them off to the mountains to live on roots, beetles, and scorpions. That is how the baboons came to have tails and their tails hang crooked!"

Our knowledge of the religious beliefs of the Bushmen is singularly deficient. It could not well be otherwise. For the collection of sound data information must be supplied from a trustworthy source—a Bushman initiated in the religious mysteries of his race, for example—to a trustworthy recipient, that is, a skilled European observer familiar with the Bushman language. But I do not know of any published conversation between two such competent persons. With few exceptions the ideas recorded are those of any ordinary uninitiated Bushman taken at hazard. As these people probably differed from one another in spiritual insight as much as we do among ourselves, we shall expect to meet with very miscellaneous and sometimes conflicting views, as in fact we do.

Still there is evidence of various kinds, much of it obtained by Arbousset and Daumas, which shows that the Bushmen as a race were not behind other hunting folk in their feeling for the unseen. They recognised a supreme power, 'Kaang, the Master of all things, who made all things, who sends and refuses the rain, who gives life and takes it away. In the words of the distinguished authors just mentioned, they say, "On ne le voit point des yeux, mais on le connaît dans le cœur," and in their prayers they call upon him saying, "O! 'Kaang, are we not your children?"

That they believed in a life after death is shown by their funeral customs. The body of the deceased was painted with red ochre and grease, covered with sweet smelling powder and buried, facing the east, in an

oblong grave.[1] His hut was cast into the grave and consumed with fire, and in some tribes his bow and staff were laid by his side. The grave was then filled up with earth, and generally, but not in all districts, stones were thrown on it by the mourners, and afterwards a stone was contributed by every passer-by till a cairn was raised.[2] The clan shifted its kraal to another place far away from the grave, because, it is asserted, they were afraid of ghosts; but this was not the only reason. Bleek in his account of the Bushmen folk-lore records the statement, made in the course of a story, that they removed to another place "in order that the children should not be thinking of their father and wanting to cry."

Livingstone,[3] after remarking that in their superstitious rites there was more appearance of worship than among the Bechuanas, adds that at a Bushman's funeral on the Zouga they addressed the dead and requested him not to be offended, even though they wished to remain still a little longer in this world.

One of their proverbs, so Arbousset and Daumas tell us, was "Lefan ki boroko," *i.e.* Death is only a sleep.

Of course all this is only one side of the picture; there was no doubt a good deal of Nature worship, the purer beliefs were adulterated with grossly material ideas and equally gross customs disgraced their religious rites. But in this respect the Bushmen are not singular.

It is curious to observe how widely spread is the

[1] Stow has made a slight slip here. In quoting from Arbousset, he has attributed to the Bushmen some funeral customs which are really those of adjacent Negro tribes; they are adduced by Arbousset in contrast to those of the Bushmen. Stow has also mistranslated "parfumés" as "embalmed." In the Kalahari, according to Passarge, the burial is in a round grave and in the contracted position.

[2] It is said that a rock shelter was also used not infrequently as a place of interment.

[3] Livingstone, *op. cit.*, p. 165.

belief in presentiments. The Bushmen have it; they say that they feel in their bodies that something is going to happen; it is a beating of the flesh which tells them things. Those who are stupid do not understand, and disobey these warnings; they get into trouble—a lion eats them or some other misfortune overtakes them.[1]

None of the African races are distinguished for chastity, and all that can be said for the Bushmen in this matter is that they were not so bad as their neighbours. Passarge remarks that the relations between the sexes, as he observed them in the Kalahari, might have been much worse; there was no prostitution, for instance, a vice which is common among the Bantus, most open and shameless among the Herero, and widely prevalent among the civilised peoples of Europe.

Marriage was celebrated by a remarkable ceremony.[2] The consent of the bride having been obtained and the approval of her parents, who received some kind of present, a day was fixed for the trial of the event: all the neighbours round about were invited to a feast,[3] and when they had all begun to make merry the young man took the opportunity to seize the bride; this was a signal for her relatives to set upon him with their digging sticks; they gave him a sound beating and a general fight ensued. If the young man could manage to keep a tight hold through all this the issue was decided; he was a married man. This is perhaps

[1] Bleek, *op. cit.*, p. 17.

[2] Described by Miss Lemué, *Notes of C. S. Orpen*, quoted by Stow, *op. cit.*, p. 96.

[3] According to Passarge, the Bushmen of the Kalahari required the young man to give proof of his powers as a hunter by killing a giraffe, a gnu, or some other big game, and it was this, his trial hunt, that furnished the meat for the feast. Nothing is said of the attack by the relatives. Passarge, *op. cit.*, p. 105.

connected with the fact that the husband was obliged to marry outside his own clan.[1] Polygamy existed, but was not much practised.

A birth was celebrated by a feast, dances and song, as also was the name-giving day.

Boys were admitted to the status of men after a course of training and an initiatory ceremony. Like the Australians, the Bushmen perforated the septum of the nose, wearing a quill for a nose peg, and it is said that the act of perforation was one of the initiatory rites.

We may recur for a moment to the Bushman's paintings in order to point out a fact of considerable importance in connexion with the cave paintings of Europe. We are told [2] on the authority of the Bushmen themselves that it was not any man of a tribe who was competent to make a painting: it was only those who were specially gifted, and when an artist had adorned the walls of a cave with his polychromes no one would dare to interfere with them so long as he was alive, nor indeed so long as his memory lasted. It was only when his name had passed into oblivion that a new aspirant for fame would venture to make fresh drawings over the old ones. In some caves as many as five distinct series of paintings are to be seen one over the other.

As regards the interpretation of the paintings, Stow strongly maintained that they are all simply æsthetic or historical, and if a mythical meaning attached to any of them, this, he thought, must have been added as an afterthought. Dr. Hahn is, if possible, even more explicit: he was well acquainted with the tribes in the Orange district, and of these one, the Annin, was at the time he wrote still given to rock painting. The old

[1] See A. van Gennep, *Les Rites de Passage*, Paris, 1909, 288 pp., in particular pp. 178–182.

[2] Stow, *op. cit.*, p. 26.

people, he tells us, men and women, teach their children and they exercise their art for the pure pleasure of representation.

The paintings, he adds, have nothing to do with the religious customs of the Bushmen.[1]

There can indeed be little doubt that some, such as the famous cattle raid, for instance (Fig. 233), are chiefly historical; others again, such as the representations of animals, seem to be pure works of art, and nothing has been elicited from the Bushmen which would suggest that they are in any way connected with sympathetic magic. In no case do any of them appear to have been concealed from women and the uninitiated.

On the other hand, there are others, certainly of a very different character, which I cannot help regarding as truly mythical. Stow himself has given a clear description of one at least. In order to understand this, we may first point out that among the Bushmen dances there was one, the most famous, indeed, of all which was directly ordained by 'Kaang himself—who was the superior person in a trinity of gods—and it was danced in his honour. This was the Mo'koma or dance of blood, so called because it often happened that in its delirious performance one or other of the dancers would fall to the ground with blood streaming from his nose. It is interesting to observe that the women who gathered round to revive this victim of the god used to place two reeds over his back in the form of a cross, which was a common Bushman symbol, and an initiated man conjured from him a foreign body, the pretended cause of his complaint.[2] By excessive indulgence in this dance

[1] T. Hahn, *Zeits. f. Ethn.*, 1879, xi, pp. 307–308.

[2] We have already alluded to the extraction of foreign bodies by the medicine-men of Australia; the same art is practised among the North American Indians and other primitive people.

some men ruined their health, and were then spoken of as "spoilt" by the Mo'koma. Such sinners were punished by 'Kaang, who had them carried off to a mysterious place situated under water, where they were transformed into beasts and otherwise chastised. We can now perceive how singularly to the point is the discovery made by Stow in the Malutis, near the source of one of the tributaries of the Eland's river, where he found a picture, painted on a rock shelter, which represented this very myth in detail. On one side are the women engaged in the dance, and near at hand three satyr-like demons, one of whom is bearing away two miserable wretches to their doom; on the other side the sinners are seen in their place of torment; they are already transformed into beasts, at least as far as their heads, and are securely pinioned with two stout sticks. One of them 'Kaang has seized and is holding him in a very painful position, while administering a sound thrashing with a heavy "'kibi" or digging-stick.

The mythological meaning is not always so patent as in this instance, and can only be interpreted by the initiated. Thus Mr. J. Orpen had a copy of one painting which several old Bushmen to whom he showed it described as two hunters disguised with the heads of rheboks chasing a jackal, but one of the initiated, Qing by name, recognised in the two hunters the mythological personages, Hagwe and Canate. "They are all under water," he added, "and those strokes are things growing under water. They are people spoilt by the Mo'koma dance because their noses bleed."

We cannot regard the next picture (Fig. 261) without wishing that Qing were here to interpret it, but we can plainly perceive, even unaided, that it must illustrate

some myth.[1] The four strange-looking monsters with toothed arms appear to be part men, part insects; possibly men disguised as insects for a religious dance; and the particular insect which they suggest to me is the Mantis. My friend and colleague, Prof. Poulton, whose advice I sought on this point, also thinks there is a good deal of Mantis feeling about them. But the Mantis was regarded by the Bushmen as a living symbol

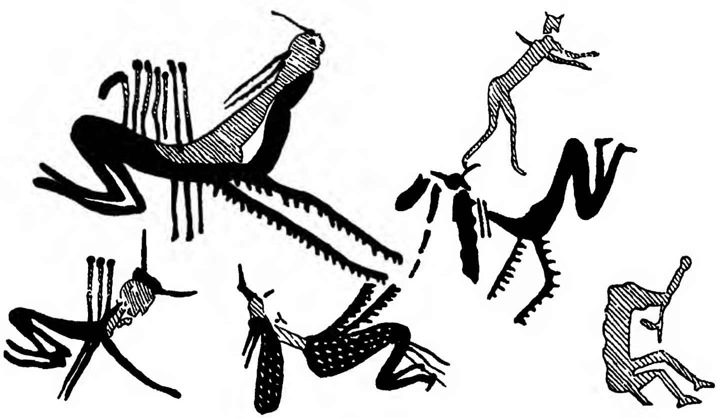


FIG. 261.—Mythical Bushman painting, from the Biggardsberg. The human figures are painted in brown, red, and yellow, the insects in blue with graduated tints. (After Prozesky.)

of the great god 'Kaang; it forms the centre of a whole cycle of folk-lore, and, still more important from M. Reinach's point of view, it was appealed to for success in hunting. Most apposite is the story M. Arbousset tells us of a father's dying speech to his son. It runs thus:—"My son, when thou goest to the chase, seek with care N'go [the name for a Mantis and also a caddis-worm] and ask food from him for thyself and thy children.

[1] The original occurs near Konigsberg, on the slopes of the Biggardsberg, a range of mountains running out from the Drakensberg: a copy in water-colour was made by Herr Prozesky, and exhibited by Herr Schloemann at a meeting of the Anthropological and Ethnographical Society of Berlin. See *Zeits. f. Ethn.*, 1896, xxxviii, p. 909.

Mark after thy prayer if he moves his head, describing an elbow, and that very evening thou shalt bring to thy mouth a portion of game, which thou shalt hold between thy teeth, and shalt cut it with thy knife, with thine arm bent, describing an elbow, like our N'go." [1]

It seems difficult to believe, but it is asserted that all [2] the Bushman dances were religious. "They are to us what prayers are to you," is a saying attributed to one

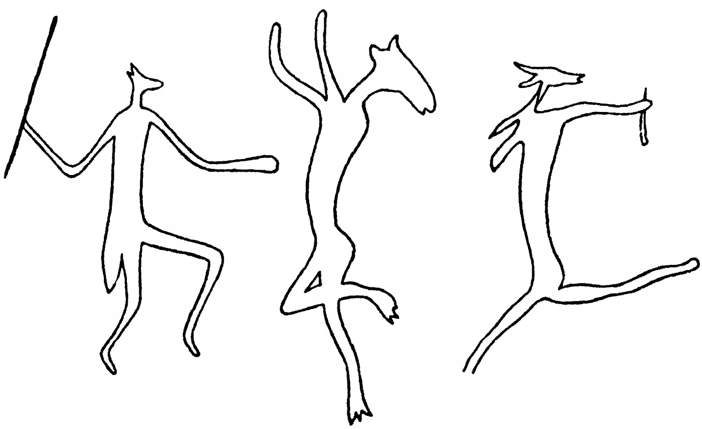


FIG. 262.—Animal-headed men in dancing postures, from South Africa. (After Moszeik.)

old hunter. If so, all dance pictures may be regarded as mythological, as well as the animal-headed figures—men, no doubt, in masks—(Fig. 262), which, save for their agility, recall the Egyptian god Anubis.

[1] The Mantis is really a very extraordinary creature, and it has given rise to some very queer notions, not only among the Bushmen, but pious Europeans. Turning to M. Fabre's delightful studies (J. H. Fabre, *Mœurs des Insectes*, Paris, 1911, p. 83), we read: ". . . Un naturaliste anglais du seizième siècle, le médecin Thomas Moffet, nous raconte que les enfants égarés dans la campagne s'adressent à la Mante pour retrouver leur chemin. L'insecte consulté, étendant la patte, indique la direction à suivre, et—ajoute l'auteur—presque jamais il ne se trompe! Ces belles choses-là sont dites en latin avec une adorable bonhomie."

[2] Passarge admits that most of them were, but asserts that some were danced for pure pleasure.

In the next picture (Fig. 263) we see a dance in progress as represented by a Bushman artist. The five central performers appear to symbolise the Mantis, two or three others appear to be musicians who are providing an accompaniment; the onlookers are men and women in attitudes which suggest either supplication or applause.

Let us now pass in review the stone and bone implements of the Bushmen, comparing them at the same time with the Palæolithic implements of Europe.

Fig. 263.—The Mantis dance reproduced from a Mural painting at Orange Spring, S. Africa. (After Miss M. H. Tongue.)

Most of the stone implements which I collected myself at Riverton on the Vaal are extremely rough and uninstructive, but Mr. J. Johnson, who has investigated several prehistoric settlements in Orangia, has found a large number which present a characteristic form, and Stow has described some which were in actual use by the Bushmen in his time.[1] The more important are the following :—(1) A disciform scraper, described as

[1] Dr. Péringuey has lately published an elaborate account of the stone implements found in South Africa (L. Péringuey, "The Stone Ages of South Africa as represented by the Collection of the South African Museum," *Ann. S. Afr. Mus.*, viii, pp. 1–215, pls.) and has described some caves containing kitchen middens, with implements in bone and stone, as well as human skeletons in burial places covered over with flagstones. In one of these caves flat stones were found painted with human and animal forms in one or more colours.

thick, flat, rudely circular, and from $2\frac{1}{2}$ to 3 inches in width. It was held between the finger and thumb, and used for dressing skins. The description would apply to some scrapers figured by Johnson[1] which are not dissimilar to Mousterian forms, such as occur in the Lower Aurignacian of Europe.[2] (2) A spokeshave, nearly flat with a deep semicircular notch, used for rounding and cleaning bows, the handles and shafts of

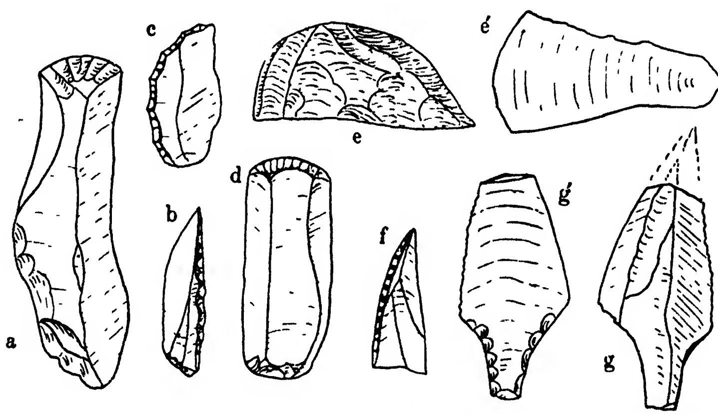


Fig. 264.—Bushman stone implements from Orangia. (After Johnson. × about $\frac{3}{8}$.)

clubs, spears, and harpoons. I have not succeeded in finding any illustrations of this. (3) Long, thin flakes, trimmed at one or both ends, which closely resemble Aurignacian and other Upper Palæolithic forms (Fig. 264 *a*, *d*).[3] (4) Scraper-planes (grattoir-rabot), which are not unlike the keeled scraper of Aurignacian age (Fig. 264 *e*, *e'*). (5) Minute flakes, some resembling Solutrean and others Tardenoisian forms (Fig. 264 *b*, *c*, *f*).

[1] J. P. Johnson, *op. cit.*, p. 62.

[2] L. Bardon and J. Bouyssonie, " Station préhistorique de la Coumba del Boutou, près Brive, Corrèze," *Bull. Soc. sci. hist. et arch. de la Corrèze*, 1907–8, pp. 54.

[3] L. Bardon and J. Bouyssonie, " Station préhistorique de Château de Bassaler, près Brive, Corrèze," *Bull. Soc. sci. hist. et arch. de la Corrèze*, 1908, p. 19.

(6) Arrow-heads (Fig. 264 *g*, *g′*), which, allowing for the fact that they are chipped out of a different stone (Lydian stone, jasper, or chert), are similar to the "*pointes à soie*" of the Upper Aurignacian (Font-Robert).[1] (7) Grooved sandstone cylinders, about 2½ inches in diameter, and 3 inches in height, with several deep longitudinal grooves down the sides used for rubbing down bone awls and arrow-heads. These find their nearest parallel in the Magdalenian. (8) Perforated stones ('tikoe) used for weighting the 'kibi or digging-stick. These were made with infinite pains out of a sandstone or hard igneous rock; the perforation was ground out day by day with Lydian stone and water. (9) Stone mortars, about six inches in diameter and eight inches high; these were worked into perfectly regular shapes, and the hollow interior was well finished and smooth. The labour this involved must have been truly appalling.

The bone implements include (1) an awl of bone or ivory, about four inches long, one-fifth to one-sixth of an inch thick, and tapering to a point at each end. All the sewing of the Bushmen was done with this; needles were as unknown to them as to the Aurignacians; they are first met with on the horizon of the Upper Solutrean. (2) Arrow heads; these, which have been already described, are not unlike some Aurignacian points. (3) A bone harpoon with long, sharp, barbed points was used for fishing. This was a highly prized possession, ranking with the 'tikoe and poison stone. Barbed harpoons are not known in Europe till the Magdalenian age. (4) A pipe for smoking; this was a tubular bone about three or four inches long. (5) A bone whistle, also a tubular bone. Such bones are not uncommon in the Magdalenian.

[1] Bardon and Bouyssonie, *loc. cit.*

We must not omit to mention that the Bushmen made a coarse kind of pottery, sometimes adorned with incised lines; similar pottery is said [1] to have been found in the Magdalenian deposits of Belgium.

The arrow-straightener, which is rather widely distributed in Aurignacian deposits (L'Abri Blanchard, Crô-Magnon, Solutré, and Ruth, as well as in Belgium), was not known to the Bushmen; reeds such as they used for shafts do not require straightening, nor, if they did, could they be straightened by mechanical means. The possession of the arrow-straightener by the Aurignacians shows that those hunters made their shafts of wood.

If we except the 'tikoe and the stone mortars, the Bushmen implements, speaking generally, are Upper Palæolithic in character, and some are Aurignacian. The common use of bone excludes the Mousterian, while the possession of barbed harpoons and other implements of an advanced type may be fairly attributed to the inventive faculties of the race. These cannot have lain idle throughout the long interval which has elapsed since the close of the Aurignacian age.

A certain amount of government had been established among the Bushmen; there were head chiefs to the tribes and sub-chiefs to the families or clans; the hunting-grounds of each family were strictly delimited and the boundaries were faithfully observed. It is said, as we have already pointed out, that the head chiefs had their residence in great caves, and that the paintings in these were the emblazonment of the symbol of the tribe.

All that we learn about the Bushmen impresses us with their great intellectual ability. Johnston mentions

[1] The evidence of the existence of pottery before the Neolithic epoch is inconclusive. The Bushman no doubt learnt the potter's art from neighbouring tribes; so, too, he obtained iron from them and substituted it for stone in his arrow-heads.

one individual he met, who conversed fluently in Dutch, spoke more English than many Boers, and was thoroughly conversant with Hottentot, Ochi-herrero, Ochi-mpo, and several Bantu dialects.[1] They were distinguished for their hospitality to strangers, and for the unselfish way in which they divided their food. They loved their country and showed an unfailing devotion to their chiefs; they possessed all the noblest of the primitive virtues. And, not least, unflinching bravery and unquenchable love of freedom. It was this last which came to be accounted to them as their greatest crime. They found it impossible to become slaves to strange masters in their own land. Equally impossible was it for a hunting race to maintain its existence in proximity to an encroaching agricultural people of European blood. A terrible war of extermination was waged against them by the Boers.[2] The stories that are told of this war are shocking to our humanity; and we cannot refuse a tribute of admiration to these brave people, who in almost every instance preferred death to surrender. Almost the only exception recorded is that of a chief who, surrounded by foes, replied to repeated calls to yield by arrows from his bow; at length, as these ran short, he accepted quarter and delivered himself up, whereupon his brains were immediately blown out. The last to be killed in this war was one of the painters. Upon his body was found a leathern belt with twelve little horns strung to it, each containing a different pigment.[3]

We have spoken of the Bushmen in the past sense,

[1] Johnston, "Tribes of the Congo," *Mem. Anthr. Inst.*, 1884, xiii.

[2] "The extermination of the Bushman was for a long time regarded by the Cape Government as a matter of State policy." W. H. Tooke, *Science in South Africa*, 1905, p. 98.

[3] Here we are reminded of the "paint-tubes" of the Aurignacians, p. 232.

for they are practically extinct; a miserable remnant of inferior character still lingers on in the Kalahari desert, but even this is slowly dwindling away under the terrible hardships of an unfavourable environment (Fig. 265).

As we have seen, the Bushmen when we first knew them inhabited the southernmost part of Africa, while the Aurignacians occupied in the remote past at least a

FIG. 265.—A Bushman and his wife in the Kalahari desert. From a photograph by Dr. A. W. Rogers, F.R.S.

part of Europe. If then the European Aurignacians, or some tribes of them, were the parent stock of the Bushmen, they must have traversed the whole length of Africa before arriving at the Cape; and Stow, who possessed an unrivalled knowledge of the Bushmen, was led by independent investigatïon to conclude that they must have migrated from the north southwards; he has even gone so far as to indicate their route. One branch of the race kept more to the westward side of

the continent in their journey south, the other kept more to the east (Fig. 266). Stow asserted that the western branch were the painters, the eastern the sculptors or engravers, and that where they came in contact the two arts were intermingled, precisely as in Aurignacian Europe.

Whether the sculptors and painters were as sharply separated as Stow supposed may be open to question, but that the original home of both lay somewhere in the

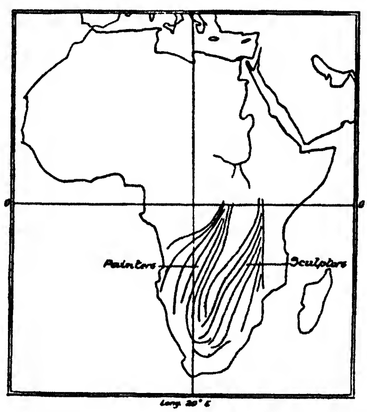


Fig. 266.—The routes taken by the Bushmen in their migrations from the Equator southwards to the Cape of Good Hope. (After Stow.)

north is extremely probable; all the evidence which has since come to light points plainly in that direction. Rude signs painted in red ochre have recently been found by Koch [1] on the right side of the Victoria Nyanza south of the Kagera river, *i.e.* in the region where Stow's lines representing the Bushmen's migrations commence on the map (Fig. 266). But rock engravings have long been known much further north than this; in the Wadi Telésaghé, near Murzuk, for instance, 25° north of the Victoria Nyanza, deeply incised

[1] R. Koch, "Anthropologische Beobachtungen gelegentlich einer Expedition an den Victoria Nyanza," *Zeits. f. Ethn.*, 1908, xi, p. 467.

outlines of animals were discovered by Barth [1] in 1850; one striking picture extending along the foot of a cliff represents a dense crowd of cattle in very various attitudes, all moving in one direction. Barth gives a sketch of this, but remarks that it does but scant justice to the original, which is "really beautiful." Another showing a bull and two bull-headed men armed with bow and arrow is singularly Bushman-like in feeling and execution. As Moszeik rightly remarks, an unprejudiced person can scarcely doubt that this is the work of the Bushmen.[2]

A little earlier than Barth, Felix Jacquot published an account of incised drawings which he observed at Tiut and Mogh'ar in the south of Oran.[3]

A great number of additional discoveries have been made more recently in northern Africa; south of Murzuk incised drawings are known in Tibesti and the region of the northern Tuaregs (Adger),[4] and north of it they extend through Algeria into Morocco, from Constantine by Aïn Sefra to Figig.[5] Some of these drawings represent extinct animals such as *Bubalus antiquus* (Fig. 267) or animals no longer inhabiting these regions, such as the ostrich, elephant, and rhinoceros. Neolithic implements have been found at the foot of the engraved rocks.

[1] H. Barth, *Travels in Africa*, London, 1857, i, pp. 197–200.

[2] Moszeik, *op. cit.*, p. 99.

[3] See F. Jacquot, "Dessins rupestres de Mogh'ar (Sud-Oranais)," *Rev. Mens. de l'École d'Anthr.*, 1906, p. 289.

[4] Duveyrier, referred to in *L'Anthr.*, 1902, xiii, p. 510; E. F. Gautier, "Gravures rupestres Sud-Oranaises et Sahariennes," *L'Anthr.*. 1904, xv, p. 495; F. Foureau, *Documents scientifiques de la mission Saharienne*, Paris, 1905.

[5] G. B. M. Flamand, "Note sur les Stations nouvelles ou peu connues de Pierres écrites du Sud-Oranais," *L'Anthr.*, 1892, iii, p. 145; "Les Pierres écrites (Hadjrat Mektoubat) du nord de l'Afrique et spécialement de la région d'In Salah," *L'Anthr.*, 1901, xii, p. 535, and "Hadjrat Mektoubat ou les Pierres écrites," *Soc. d'Anthr. de Lyon*, 1902, 48 pp. 8vo, and *L'Anthr.*, 1902, xiii, p. 510.

Ancient petroglyphs also occur in Egypt, as for instance in the Wadi Hammanat between Edfu and Silsilis.[1]

It would thus appear that mural drawings, paintings or engravings, having many features in common, may be traced from the Dordogne across the Pyrenees into Spain, and beyond the Mediterranean into Morocco, Algeria, Oran, and Egypt, over the Sahara, past the Victoria Nyanza, and thence on through Rhodesia, the

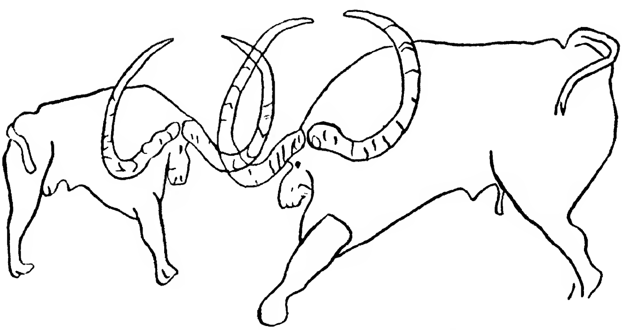


FIG. 267.—Deeply incised drawings of *Bubalus antiquus* from the Col. d'Er Richa, Aflu, Southern Oran. Reproduced from a photograph which is slightly distorted, owing to its being taken at too short a range. (After Flamand, *L'Anthr.*)

Transvaal, and Orangia, to the southernmost extremity of Africa.

If, as their unity in subject and treatment suggests, these are all the work of the Bushmen or related tribes, then they afford precisely the kind of evidence which our hypothesis demands, and some of the Aurignacian people have really, as we supposed, passed in a slow migration across the whole of the broad territory which intervenes between Dordogne and the Cape. That the movement was towards the south is shown by the fact that the drawings become increasingly younger as we proceed in that direction. In France they are of Upper Palæolithic age, in the North of Africa Neolithic, and

[1] G. B. M. Flamand, *op cit.*

in the South they are recent. From this again it follows that the migration must have occupied a long interval of time, during which the earth experienced more than one change of climate, and some of the animals which the artists took a special pleasure in depicting, such as the mammoth and the ancient Bubalus, became extinct.

We owe our knowledge of this great migration to a fortunate accident: had the passion for art which possessed the Bushmen been less strong or less enduring, it would probably have remained unsuspected to all time. It would be strange indeed if this were the sole migration of its kind, the chances are that it is but one among others, some of which may not be beyond our power to discover.

As we glance back over this inquiry our eyes naturally turn to the scene in the cavern of Altamira, and rest there with pleasure on the little Señorita de Sautuola and her wonderful "Toros" which started us on our long and adventurous investigation.

And last a word of farewell to the Bushmen. The more we know of these wonderful little people the more we learn to admire and like them. To many solid virtues—untiring energy, boundless patience, and fertile invention, steadfast courage, devoted loyalty, and family affection—they added a native refinement of manners [1] and a rare æsthetic sense. We may learn from them how far the finer excellences of life may be attained in the hunting stage. In their golden age before the coming of civilised man, they enjoyed their life to the full, glad with the gladness of primeval creatures. The story of their later days, their extermination, and the cruel manner of it, is a tale of horror on which we do not care to dwell. They haunt no more the sunlit

[1] A Bushman serving boy in an English family apologized to his mistress for the rough manners of some companions who had visited him and excused them on the ground that they had lived so much among white people!

veldt, their hunting is over, their nation is destroyed; but they leave behind an imperishable memory, they have immortalised themselves in their art.

Before leaving Africa, however, there is one important question which remains to be answered and that is, whether this continent was peopled by other races previous to the Bushman migration.

The Bushmen themselves are said to have asserted that they had never encountered, and had no knowledge of, any earlier inhabitants, but this is inconsistent with the fact that Bleek cites as the title of one of their folklore stories "A primitive race that preceded the Bushmen" and the discovery of Lower Palæolithic implements about the Zambesi and elsewhere is proof of an antecedent population at a very remote time.

Recently, however, evidence still more to the point has been afforded by the discovery of human remains of a comparatively recent date at Broken Hill in Rhodesia: these consist of one skull (Fig. 268) and part of another, together with some additional bones of the skeleton. These were associated with implements of bone and stone such as might be referred to the Aurignacian age, and with large quantities of the broken bones of animals killed in the chase, which bear testimony to a hunting life and to Gargantuan feasts. These, and the human bones as well, are said, in the first place, to be in a remarkably fresh condition, and next, to be encrusted with a thin coating of silicate of zinc. It seems probable that these two facts stand in the relation of cause and effect, the mineralising solutions having arrested the decay of the bones.

The broken bones are also supposed to indicate a comparatively recent date for the deposit, since they

belonged to species of animals identical with those now existing in the neighbourhood.

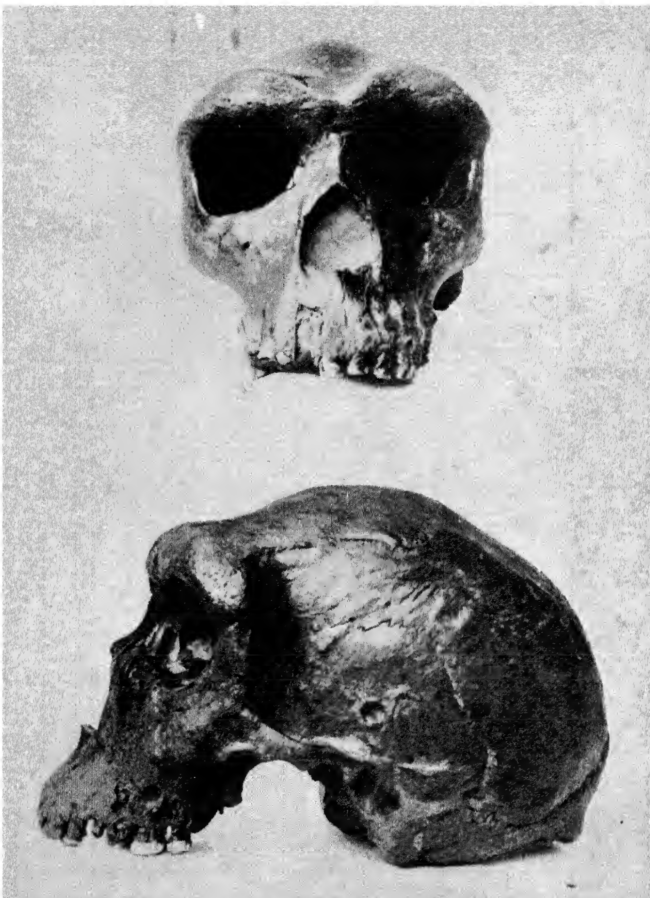


FIG. 268.—*Homo rhodesiensis* (Smith Woodward). (After Smith Woodward.)

The climatic conditions of Africa are, however, so different from those of Europe as to render it possible or even probable that its fauna was not subjected to such remarkable changes as those which affected the more northern regions.

Further than this some of the bones of the deposit belonged, as my friend Dr. Broom assures me, to an extinct species of rhinoceros.

The skull itself is of great interest, not only as evidence of a race distinct from the Bushmen, but of one so different from all the existing varieties of mankind as to involve the creation of a new species which has received the name of *Homo rhodesiensis* (Smith Woodward).[1]

The face is enormous and overhung by great bony arcades which resemble the frontal torus of the Neandertalians or the supra-orbital ridges, immensely over-developed, of the Australians.

As in the Neandertal skull a canine fossa is absent and, in partial connexion with this, the arch made by the cheek bones (jugal process of the maxilla and jugal bone) forms a continuous curve, passing in the first part of its course gently outwards and backwards. In *Homo sapiens*, on the other hand, an abrupt inflexion occurs in the neighbourhood of the maxillary-jugal suture, the maxillary part of the arch making nearly a right angle with the jugal. This characteristic difference Rhodesian man shares with the Neandertal man as represented by the skulls from Gibraltar and La Chapelle-aux-Saints, and we meet with it again in the Anthropoid apes, where it is especially marked in the Chimpanzee.

The nose is rather Australian, but its aperture is narrower and at its lower margin ends in unusually pronounced nasal gutters.

What is commonly called the "upper lip" or the part corresponding to it in the skull, *i.e.* the space

[1] The Rhodesian skeleton has not yet been fully described, but a preliminary account has been given by Dr. Smith Woodward (*Nature*, vol. cviii, 1921, pp. 413, 485, and in the *Guide to Fossil Remains of Man in the British Museum*. My best thanks are due to Dr. Smith Woodward for affording me ready access to the Rhodesian remains and for permission to obtain the sagittal sections of the skull which figure in the text.

between the lower margin of the nasal aperture and the teeth is remarkable for its length, thus exaggerating a human character and offering a marked contrast to the Anthropoid apes. The nearest approach to this is afforded by the Neandertal skull and also by the Talgai skull already described (p. 339).

The palate is very large and well domed, not flattened as in the apes, and the teeth though large are also distinctly human. It may be noted by the way that they were seriously affected by disease. In the skull of the youthful Mousterian from La Quina we had occasion to refer to the signs of gingivitis which it presents; and now we meet for the first time in the history of mankind with caries, the peculiar bane of civilization.

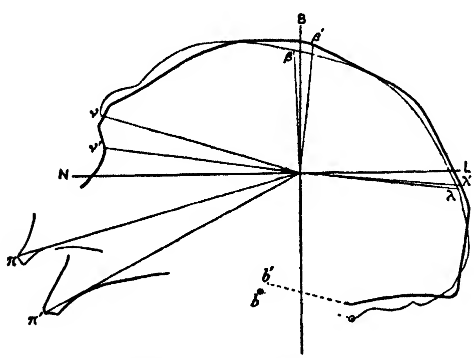


Fig. 269.—Sagittal section of the skull of *Homo rhodesiensis* (thick line) compared with that of La Chapelle-aux-Saints.

The brain case, which is not excessively thick, measures 210 mm. in length, 131 mm. in height and 145 mm. in width, it is thus extremely dolichocephalic (index 60·9) a result partly due to its great brow ridges. Its sagittal section (Fig. 269) recalls in its general outline Pithecanthropus. The nasion angle measures $-8°$ and is thus intermediate between that of modern man and Neandertal man as represented by the skull of La Chapelle-aux-Saints.

On each side of the bregma is an oval depression which corresponds to a smooth flattened area of the brain, another character reminiscent of Pithecanthropus,

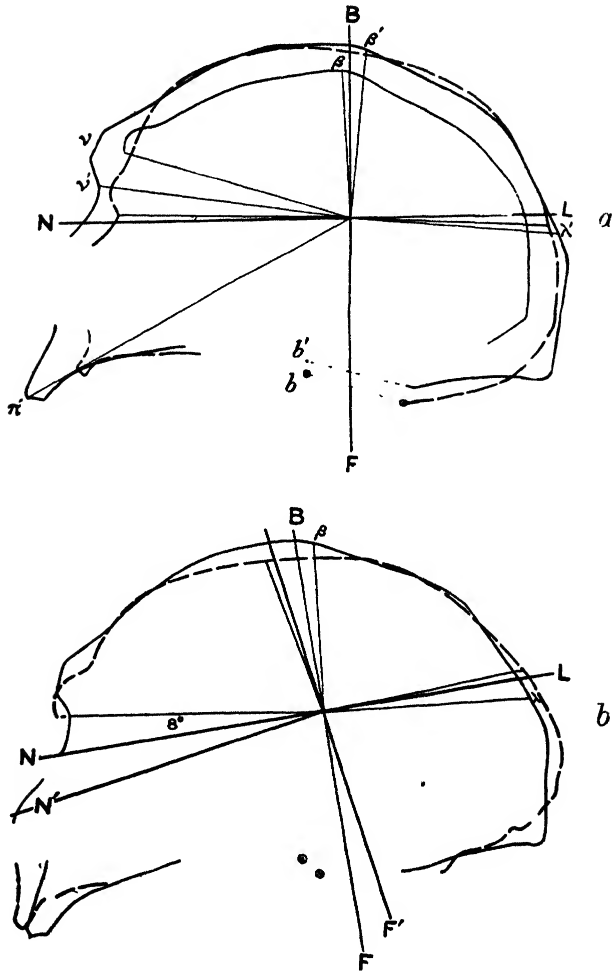


Fig. 270.—*a*. Sagittal section of the Rhodesian skull (thick line) compared with that of Pithecanthropus (thin line) and an Australian (broken line). Attention may be drawn to the remarkable correspondence between the bregmatic eminence of the Rhodesian skull (near β') and of the Trinil skull (near β), and of the corresponding depression behind this eminence. The excessive length of the Rhodesian face as compared with the Australian is also well shown.

b. Sagittal sections of the Rhodesian skull and the Neandertal skull from La Chapelle-aux-Saints (broken line) superposed on a common centre and the nasion radius of each. It will be seen that the

and regarded by Prof. G. Elliot Smith as distinctly primitive.[1] The cranial capacity is low, 1280 c.c., or identical with that of Eoanthropus (as restored by G. Elliot Smith), and nearly the same as in the Gibraltar skull (1250 c.c.).

Of the other bones the femur is straight and not curved as in the Neandertalians; but this is a character of racial importance only, the Bushmen have a curved femur and Pithecanthropus a straight one.

On a general survey, it would appear that *Homo rhodesiensis* presents several of the characters of Neandertal man, some of them, indeed, in an exaggerated degree, but it also shows some resemblance to Pithecanthropus, and in the magnitude of the nasion angle makes a nearer approach to *Homo sapiens*, especially its Australian variety. At the same time the differences which distinguish it from all these are sufficient to entitle it to the rank of an independent species.

If any doubt could be possible on this point it would arise from the suspicion that we might be basing too much on a single example—an isolated sport perhaps or a pathological monstrosity. Fortunately we are relieved from all misgivings by the later discovery of some fragmentary remains of another and similar individual from the same deposit. The Rhodesian man was thus evidently provided with at least one companion of his own kind.

Such possibly were some of the inhabitants of Africa when the Bushmen first wandered through the land.

[1] G. Elliot Smith, "On the Brain of Rhodesian Man," *Nature*, vol. cix, 1922, p. 355.

CHAPTER X

THE SOLUTREAN AGE

During this period the fabrication of flint implements attained a perfection which has evoked the admiration of all archæologists. Some of the best work recalls that of the Neolithic epoch, and has never been excelled except by the knives of the late pre-historic period in Egypt.

The art reached its culmination in the Upper Solutrean; deterioration then set in and continued till a fresh climax was reached after the Palæolithic epoch had come to an end. The earliest examples of the Lower Solutrean are comparatively primitive arrowheads[1] (Fig. 271, 7), which already possess, however, a well-developed tang (*flèche à peduncle*) and thus mark an advance in this method of attaching the head of the arrow to the shaft. These are immediately succeeded by the beautiful implements (Fig. 271, 1, 2) known from the shape of their outlines as laurel-leaf and willow-leaf points (*pointes en feuille de laurier et en feuille de saule*); they are evenly flat and remarkably thin, so thin in some cases as to be translucent; but the character which especially distinguishes them is the beauty of the secondary flaking (Solutrean retouch). In this process thin scales were split off with great regularity, leaving long, shallow, nearly parallel furrows which run from

[1] The Abbé Breuil now assigns these forms to the very end of the Aurignacian.

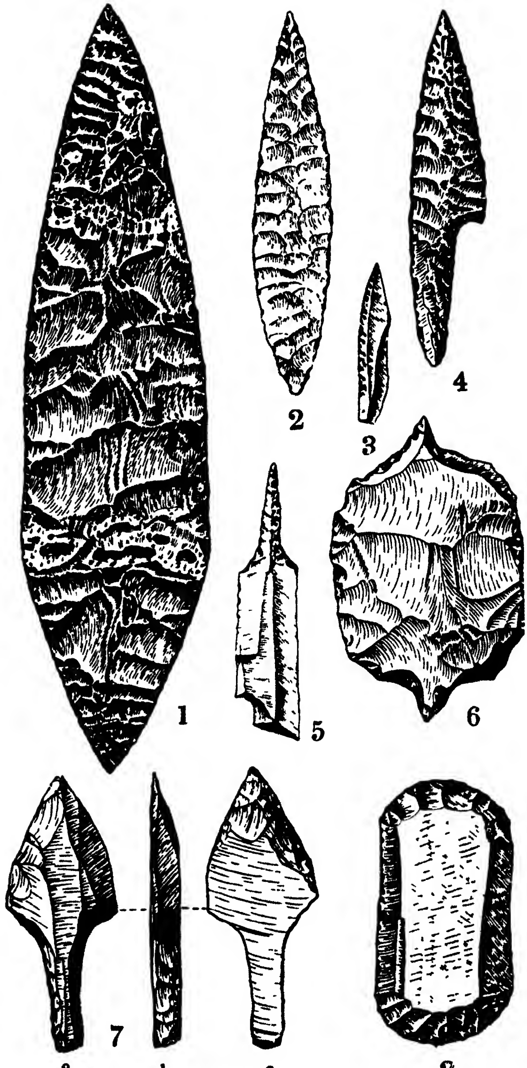


FIG. 271.—Solutrean Flint implements. 1. The largest known complete Solutrean point, pointe en feuille de laurier, from Volgu, Rigny-sur Arroux (Saône-et-Loire). ($\times \frac{1}{3}$ about.) 2. Pointe en feuille de saule. ($\times \frac{2}{3}$.) 3. Small pointed flake, Grottes de Baoussé-Roussés. ($\times \frac{2}{3}$.) 4. Pointe à cran, Grotte d'Église, St. Martin d'Excideuil, Dordogne. ($\times \frac{2}{3}$ about.) 5. Borer, Grotte d'Église. ($\times \frac{3}{5}$.) 6. Double-pointed borer, Grotte d'Église. ($\times \frac{3}{5}$ about.) 7. Tanged arrow-head, La Font-Robert, Corrèze. ($\times \frac{2}{3}$ about.) 8. Double scraper, Grotte d'Église. ($\times \frac{2}{5}$.) (No. 7 after Bardon and Bouyssonie, the rest after G. and A. de Mortillet.)

the edge of the implement up towards the middle; both sides of the laurel-leaf points have been dressed all over in this way. Some of the finest examples, fourteen in number, which appear to have been buried in a "cachette," were discovered in making a canal near Volgu (Saône-et-Loire). The unusual size of these—one is as much as 0·35 metre in length—and extreme thinness has led to the rather unlikely suggestion that they were votive offerings not intended for common use, and it is asserted in confirmation that one of them was painted with red ochre.

The larger forms of the leaf-like points, some of which are not unlike the broad bladed assegais of Africa, were used as spear-heads; the smaller as arrow-heads.

The leaf-like points are found in both the Lower and Upper Solutrean, but another characteristic form—the shouldered point (*pointe à cran*)—is restricted to the Upper stage. This (Fig. 271, 4) is often spoken of as "typique" to distinguish it from the less developed Aurignacian shouldered point. It is dressed on one side only, and its margin is sometimes coarsely serrated. The shoulder is almost always on the right hand. (To orientate the implement, it should be placed on its flat face with the point forwards.)

Besides these especially characteristic forms there are others which belong to the general class of scrapers, drills and burins (Fig. 271, 3, 5, 6, 8), as well as minute flakes, the precise purpose of which is unknown.

The suggestion that some new method of flaking had been introduced in Mousterian times makes itself still more strongly felt in the case of the Solutrean retouch.

To discover what this method was we shall naturally turn to the recent races who have fabricated implements most like the Solutrean. Of the many Europeans who

have travelled among the American Indians and watched the flint maker at his work, the earliest to record his observations is Captain John Smith, who wrote in 1606:—"This arrow head he quickly maketh with a little bone which he ever weareth at his bracer. . . ." [1]

Torquemada [2] follows (1615) with a more elaborate account of the method employed by the Mexicans who used as a flaking tool the shaft of a lance, about 4 feet in length. This was held in both hands in such a manner that it rested at one end against a block of obsidian—grasped between the feet as in a vice—and at the other against the breast of the worker.

By bending forwards great pressure is applied and then off flies a flake. It is evident, however, from Torquemada's account that this was not a process of retouching.

Prof. Goddard [3] has described pressure flaking as he saw it practised in California; he says that the flaking bone was provided with a handle about 15 inches long which was grasped in such a manner that for the greater part of its length it lay along the forearm, thus enabling the worker to exert great pressure on it.

Perhaps the best account of pressure flaking as practised by the Eskimo is given by Admiral Belcher,[4] who writes:—" . . . . Probably had I not witnessed the operation . . . the idea would have remained undisputed that they [the arrow-heads] owed their formation to the stroke of a hammer. Being a working amateur mechanic myself . . . I was not surprised at . . . the modus operandi.

[1] John Smith, "Sixth Voyage," 1606, *Pinkerton's Travels*, xiii, p. 36.

[2] J. de Torquemada, *Monarquia Indiana*, Seville, 1615, lib. xvii, translated by E. B. Tylor. "Anahuac," p. 331.

[3] P. E. Goddard (Univ. California, Publications), *Am. Arch. and Ethn.*, 1904, i. p. 34, pl.

[4] Sir E. Belcher, *Trans. Am. Ethn. Soc.*, 1861, New Ser. I, p. 138, and *Rev. Arch.* 1861, iii, p. 341.

"Selecting a log of wood in which a spoon-shaped cavity was cut they placed the splinter to be worked over it and by pressing gently along the margin vertically, first on one side and then on the other, as one would set a saw, they splintered off alternate fragments. . . ."

Of the flaking tool he adds :—"First this instrument has a graceful outline. The handle is of pure fossil ivory. [This however] would be too soft [for the working end and] they discovered that the point of the deer horn is harder and also more stubborn; therefore in a slit, like lead in our pencils, they introduced a slip of this substance and secured it by a strong thong, put on wet, which on drying became very rigid. . . .

"The very same process is pursued by the Indians of Mexican origin in California with the obsidian points for their arrows, and also in the North and South Pacific, at Sandwich Islands (21° N.) and Tahiti (18° S.) . . . 2,340 miles asunder," and we may add by the Fuegians who are very expert in the dressing of flint. Krause remarks that the fine flaking is produced by pressure skilfully applied by means of a piece of bone such as an old harpoon deprived of its point.

Another process is mentioned by T. R. Peale in which the flakes are wrenched off by a notched piece of horn "as a glazier chips glass."

Schoolcraft [1] gives an account of flaking by blows and remarks that "such is the art required in this business . . . that it is . . . the employment of particular men, generally old men, who are laid aside from their hunting. . . ."

Catlin [2] describes a method of punching off the flakes. Two workmen co-operate, one to hold the stone and

[1] Schoolcraft, *North American Tribes*, iii, p. 467.
[2] Catlin, *Last Rambles among the Indians*, pp. 187–190.

direct the punch, the other to deliver the blow. The punch is made of the tooth of a sperm whale. "The operation," he says, "is curious, both the holder and striker singing, and the strokes of the mallet given exactly in tune with the music and with a *sharp rebounding* blow, in which the Indians tell us is the great medicine of the operation."[1] He also remarks that "Every tribe has its factory . . . and in these only certain adepts are able or allowed to make them for the use of the tribe."

As a last method may be mentioned one used by the Shasta[2] and Snake River[3] Indians as well as by the Australians[4]; in this the flint is laid on a stone which serves as an anvil and struck by another which serves as a hammer.[5]

Perhaps after reading this account we shall feel inclined to agree with Dr. Holmes that no mystery now attaches to the fabrication of flint implements, but after studying a well dressed laurel-leaf point or a finished Eskimo arrow-head our feeling will be best expressed by Sir John Evans, who, while agreeing that surface flaking can be produced by the point of a deer's antler, yet concludes that the long channelled flaking still remains a mystery.

Bone and ivory continued in use throughout the period; at first there was a falling off in this industry,

[1] In our idiom "the secret of success."

[2] C. Lyon, *Trans. Ethn. Soc.*, N.S. iii, 356.

[3] Schoolcraft, *op. cit.*, i, 212.

[4] Baines, *Anth. Rev.*, iv, p. civ.

[5] For further information on methods of flaking see :—Sir John Evans, *Ancient Stone Implements*, London, 2nd ed., 1897, Caps. ii and xvii; W. H. Holmes, "Manufacture of Stone Arrow Points," *American Anthropologist*, 1891, iv, p. 49, and "Stone Implements of the Potomac, etc.," *Rep. Bur. Eth.*, 1897, xv, pp. 58, 80 *et seq.*; G. Fowke, "Stone Art," *Rep. Bur. Ethn.*, 1896, xiii, pp. 139–142; T. Wilson, "Arrow-heads, Spear-heads, and Knives of Prehistoric Times," *Rep. National Mus. Smithsonian Inst.*, 1897, i, p. 881.

but later on a recovery: arrow-straighteners, smoothers and simple spear-points were occasionally made of these materials, and, as we have already seen, the earliest bone needles are met with on the Upper Solutrean horizon. A single instance is known of engraving on bone. Evidently a good deal of painting was carried on, for lumps of raw pigment, ochre, and graphite are frequently met with in Solutrean hearths.

The classic station from which the industry derives its name is Solutré,[1] not far from Maçon (Saône-et-Loire). The kitchen-midden at this place, called the Crot-du-Charnier, lies at the foot of a long scarp of Jurassic limestone, which rises as an isolated hill out of the surrounding plain. Here we find the famous magma of bones, which, though originally assigned to the Solutrean, belongs, as the Abbé Breuil has shown, to the Aurignacian; the true Solutrean immediately overlies it (Fig. 182).

FIG. 272.—Bone needles from La Cave. (After Viré, *L'Anthr.*)

The Grotte du Placard[2] (Charente) is another important station. It was very carefully excavated by M. de Maret; both upper and lower divisions of the Solutrean were met with overlying the Mousterian, the Aurignacian being absent. Several Magdalenian horizons succeeded the Solutrean. Some large laurel-leaf

[1] A. Arcelin.

[2] A. de Mortillet, "La Grotte du Placard," *Assoc. Française pour l'avancement d. sciences*, Congrès de Lyon, 1906; *ib.*, Congrès Préhistorique de France, ii, Vannes, 1906. H. Breuil, "L'aurignacien présolutréen," *Rev. préhistorique*, 1909, iv, p. 6.

points were obtained, and from the upper horizon a prodigious number (5000) of pointes-à-cran, as well as

FIG. 273.—Mammoth carved in ivory from Předmost. (After Breuil.)

a quantity of worked ivory, including the armlet already alluded to (Fig. 179), and bone awls with prettily incised heads, but no needles. At the interesting Upper Solutrean station of La Cave[1] (Lot), on the other hand, needles (Fig. 272) were found, but no awls, although the cave is otherwise rich in

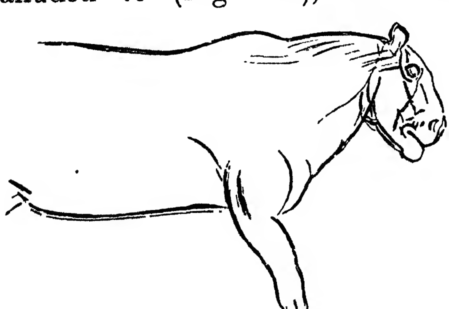


FIG. 274.—Engraving of a cave lion from Combarelles. (After Breuil. × nearly $\frac{1}{10}$.)

[1] A. Viré, "La Cave," *L'Anthropologie*, 1904, xv, p 411

worked bone and has afforded an arrow-straightener with primitive carving.

One of the most remarkable stations in the upper löss is situated at Predmost (68 km. N. of Brünn). Here the löss of the plains wraps round an isolated hill in a mantle 20 metres thick and the Solutrean horizon occurs 3 or 4 metres below the surface. It is associated with a rich fauna, which includes the reindeer, horse, arctic fox, snowy-hare and mammoth. Of the mammoth there were the remains of no fewer than 900 individuals, of all ages from the ancient of the herd down to the newborn calf. Notwithstanding the abundance of bone implements found in association with this fauna, some of them in ivory, there were critics who had the courage to express doubts of the contemporaneity of man and these animals, hence the discovery of a statuette of a mammoth (Fig. 273)

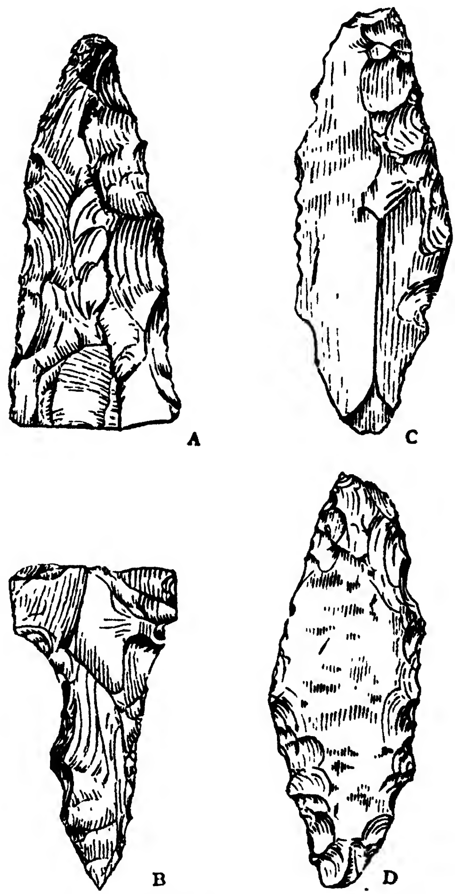


Fig. 275.—Proto-Solutrean implements from Paviland. A B, fragments of a point or poignard, similar to one from Font-Robert; C D, a rude laurel-leaf point. (× about $\frac{2}{3}$.)

carved out of mammoth's ivory came as a welcome confirmation.[1]

Whether the Solutreans practised the art of mural decoration may be considered an open question. Probably they did, and several drawings are rather doubtfully

FIG. 276.—The distribution of Solutrean stations in Europe.

assigned by the Abbé Breuil to this period. The engraving of a cave lion from Combarelles, for instance (Fig. 274), has been referred to the Solutrean.

In our country flint implements of early Solutrean age have been found at Kent's Hole and Creswell Crags (Figs. 67 and 299), and some early enough to be termed

[1] K. Maska, H. Obermaier and H. Breuil; "La Statuette de Mammouth de Předmost," *L'Anthr.*, 1912, xxiii, p, 273 *et seq.*

"Proto-Solutrean" were lately obtained from Paviland (Fig. 275).

The distribution of Solutrean stations in Europe is shown on the accompanying map (Fig. 276). It is a remarkable fact, first pointed out by the Abbé Breuil,[1] that none are known in the Iberian peninsula, south of the Cantabrian mountains; none in France, east of the Rhône, and none in Sicily, Algiers and Phœnicia. Indeed, the Solutrean industry seems to be absent throughout the Mediterranean province, its place being taken in all probability by some part of the Capsian, *i.e.* by horizons characterised by an Aurignacian industry but of Solutrean age.

On the other hand, it is present in many localities towards the east, as in Poland and Hungary, where hitherto the typical Aurignacian has not been observed; in these regions the Lower Solutrean with laurel-leaf points lies in a horizontal layer over a deposit containing rude implements worked upon both faces, which may be regarded, according to the Abbé Breuil, as small degenerate bouchers of Upper Mousterian age.

Such a distribution leads us to look for the original home of the Solutreans somewhere in the East. Thence we may suppose this war-like race with its formidable flint assegais and equally formidable arrows issued to invade the Aurignacian hunting grounds of western Europe and remained in possession until the advent of the Magdalenians. It seems not improbable that climatic changes may have had some share in determining this wandering of peoples.

The Solutrean occupation was apparently only an episode in the prehistory of Europe, but the Solutrean

[1] H. Breuil, "Les subdivisions du paléolithique supérieur," *Congrès Internat. d'Anthr.*, 1912, xiv, pp. 190–193.

people, and still more probably the Solutrean industry, may have enjoyed a more prolonged existence under more favourable conditions elsewhere. The industry may have survived the people, as it certainly survived the Palæolithic epoch, reappearing in the flint weapons of Neolithic Europe and spreading in ever widening circles till it found its way in later times over the greater part of the world.

Fig. 277.—Leaf-shaped point from a mound near Naples, U.S.A. (After Wilson.)

The characteristic retouch, scarcely modified, is seen again in the broad-bladed spear-heads and delicately flaked arrow-heads of Europe; in the great laurel-leaf and willow-leaf points of America (Fig. 277), especially in the Argentine, California, and Mexico; in some of the implements of the Australian aborigines, and in its most perfect form in the exquisitely worked knives of Egypt.

Of the bodily characters of the Solutreans nothing whatever is known. The skeletons discovered at Předmost, once thought to belong to this mysterious race, are now found to be Aurignacian.

The horse and the reindeer were the most abundant animals of the age, and the fauna and flora as a whole show that the climate was not so genial as in Aurignacian times; the intense cold, which was afterwards to dominate the Magdalenian age, was already beginning to make itself felt.

CHAPTER XI

MAGDALENIAN MAN

IN caves where the succession of deposits is complete a comparatively thin layer of loam, often not more than twenty to thirty inches in thickness, and sometimes not even that, is all that separates the Magdalenian stage from the underlying Solutrean; yet the change in the general character of the industrial art is complete.[1] The flint implements are less elaborated, simpler in style, and often lacking in finish; the elegant Solutrean laurel-leaf points have disappeared, and we meet instead with long thin flakes, like those of the Australian aborigines (p. 270), and splinters which have been converted by a minimum amount of dressing [2] into scrapers, gravers, drills and other simple tools (Fig. 278).

[1] If there is one fact more certain than another in prehistory it is that the first Magdalenians were not evolved from the Solutreans; they were new-comers in our region, as unskilled in the art of shaping and retouching a flint as their predecessors excelled in it. The Abbé Breuil, "Les subdivisions du paléolithique supérieur," *loc. cit.*, p. 201.

[2] The marginal dressing of Palæolithic flints has been minutely studied of late, with the result that it is now often possible to determine the epoch of an implement by observation of its edge alone (see Bardon and Bouyssonie, "Outils écaillés par percussion," *Rev. de l'École d'Anthr.*, 1906, xvi, p. 170; *ib.*, "La Grotte de la Font Robert," *Bull. Soc. sci., hist., et archéologique de la Corrèze*, 1908; *ib.*, "La Coumba-del-Bouïtou," *Bull. Soc. sci. de Corrèze*, 1907–8). R. R. Schmidt, "Entwicklung der paläolithischen Steintechnik," *Mannus*, 1910, I, Ergänzungsband, p. 98, gives the following summary:—*Chellean*, the retouches are coarse, broad, conchoidal, leaving strongly marked concavities. *Acheulean*, the retouches are also conchoidal, but narrower, longer and finer. In the *Lower Mousterian* they are similar to the Upper Acheulean. *Upper Mousterian*, "stepped" retouch, short, scaly retouches following one behind the other, and becoming smaller as they approach the edge. *Aurignacian* (i) "channelled" retouch; strong, regular furrows extending over the whole margin of the flake, (ii) "Aurignacian" retouch; the scraping end of a flake is rounded by fan-like retouches. *Solutrean*, "scaly" retouches, fine, thin scales are flaked off from the whole surface. *Magdalenian*, the edge is rarely dressed over its whole extent; a "nibbling" retouch which grows smaller as the age draws towards its close.

It is not to these flints, however, that we must look

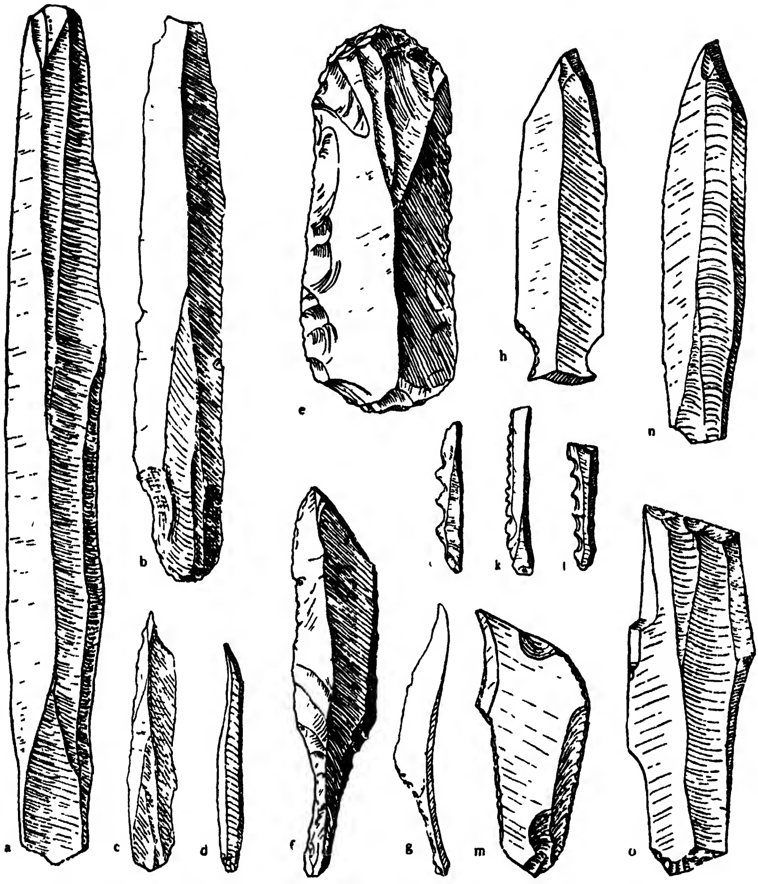


FIG. 278.—Magdalenian flint implements, except *o*, which is Aurignacian (all $\times \frac{1}{2}$). *a*, *b*, end scrapers; *c*, *d*, awls; *e*, scraper; *f*, *g*, pen-knife flakes with saw-like base; *h*, burin or graver; *i*, *k*, *l*, denticulated flakes; *m*, parrot's-beak burin; *n*, burin; *o*, lateral burin. *a*, *c*, *d*, *i*, *n*, from Laugerie Basse; *b*, *g*, *k*, from La Madeleine; *e*, from Crô-Magnon; *f*, *l*, from Les Eyzies; *h*, from Gorge d'Enfer; *m*, from the Abri de Soucy, Dordogne; *o*, from the Grotte de Noailles, Corrèze. (All after Rel. Aquit., except *a*, after Girod et Massénat; *h*, *m*, *n*, after G. and A. de Mortillet, and *o*, after Bardon and Bouyssonie.)

for the distinctive character of the Magdalenian industry; they still played an important part, not directly as

weapons of the chase, but as the implements by which those weapons were made.

The new kind of material which had previously come into use—bone, reindeer's horn, and mammoth's ivory—possessing very different properties from flint, and requiring a different kind of workmanship, effected a revolution in the arts. The arms it furnished to the hunter increased in the number and complication of their forms, and new kinds of implements were devised which added to the comforts of daily life. The stimulus of discovery led to rapid progress in the new industry, and the deposits in the caves reveal at least three stages [1] in its development, succeeding one another in a definite order from the simpler to the more complex; thus as the characteristic of the first stage we have the simple point (Fig. 279), of the second the harpoon with a single row of barbs, and of the third the harpoon with two rows of barbs, one on each side (Fig. 280).

[1] In his brilliant memoir on the Subdivisions of the Upper Palæolithic, already cited, the Abbé Breuil subdivides the Magdalenian into five or six distinct stages, as follows :—

Upper Magdalenian	Stage 6, *b* ,, 6, *a*	Harpoons with two rows of barbs.
Middle ,,	,, 5.	Harpoons with one row of barbs.
Lower ,,	,, 4.	Harpoons primitive.
	,, 3. ,, 2. ,, 1.	No harpoons. Lance points.

For the Cantabrian provinces of Spain Dr. Obermaier gives the following stages :—

Stage 6.	No harpoons. Small round racloirs
,, 5.	Harpoons with two rows of barbs
,, 4.	Harpoons with one row of barbs
Stage 3.	Large round points.
,, 2.	Points square or triangular in section.
,, 1.	Points *slightly curved, flattened on the side for attachment.*

When we have occasion to refer to M. Breuil's classification we shall indicate the stage by number, with his name placed after it.

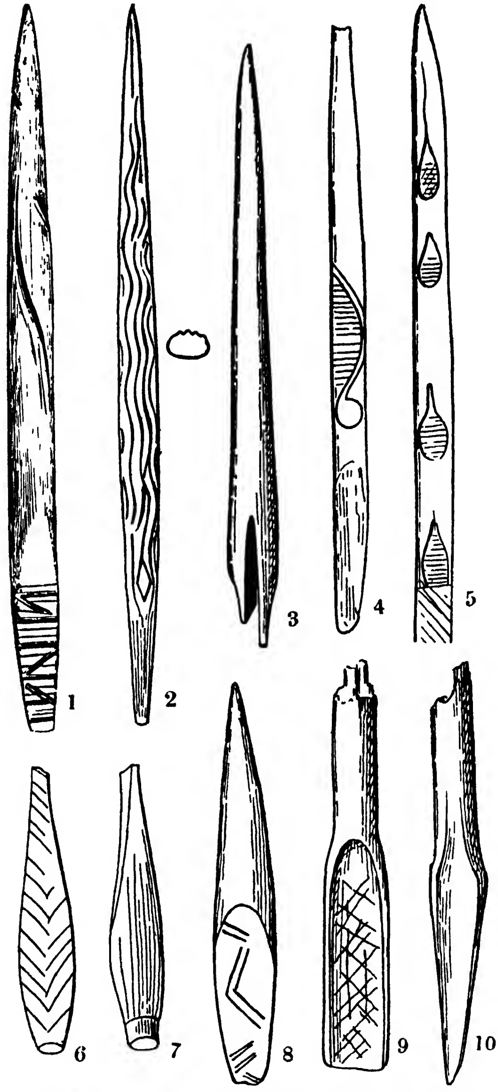


FIG. 279.—Lower Magdalenian spear-heads and arrow-heads. 1. In ivory, from the Grotte de la Garenne, Saint Marcel. (After Breuil, *L'Anthr.* × $\frac{4}{7}$ *circa.*) 2. In reindeer horn, from Laugerie Basse, Reliq. Aquitanicæ. (× $\frac{1}{2}$.) 3. From Laugerie Basse. (After Girod and Massénat. × $\frac{1}{2}$.) 4 and 5. From the cave of Maszycka, near Oiców, Poland. (After Ossowski. × $\frac{1}{2}$.) 6 and 7. From the Freudental Cave, Schaffhausen. (After Karsten. × about $\frac{1}{2}$.) 8. From Brassempouy. (After Piette and de la Porterie, *L'Anthr.* × $\frac{2}{3}$.) 9 and 10. From Salpêtrière. (After Cazalis de Fondouce. × $\frac{7}{10}$.)

It is important, however, to observe on the one hand that the simple points of the first stage are accompanied by rudimentary prototypes of the harpoons

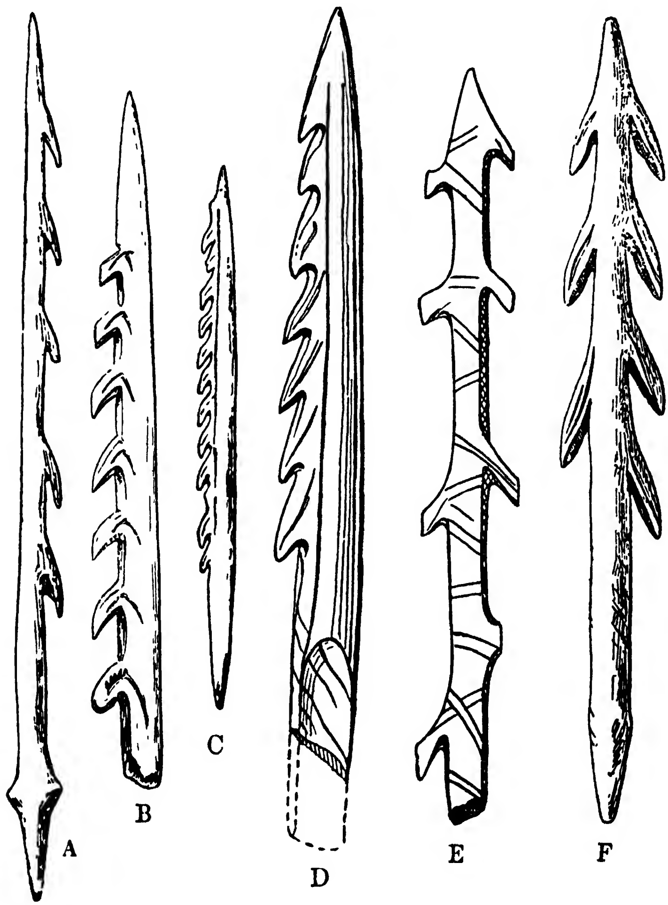


Fig. 280.—Barbed harpoons from the Upper Magdalenian (A, B, C, D) (stage 5), Breuil, and (E, F) (stage 6*a*), Breuil. A, from the Grotte du Roc du Courbet, Bruniquel. (After Cartailhac, *L'Anthr.* × $\frac{2}{3}$.) B, from St. Marcel. (After Breuil, *L'Anthr.* × $\frac{2}{3}$.) C, from Bruniquel. (After Cartailhac, *L'Anthr.* × $\frac{2}{3}$.) D, from Salpétrière. (After Cazalis de Fondouce. × $\frac{2}{5}$.) E, from Kesserloch, near Thayngen. (After Merck. × $\frac{2}{3}$.) F, from Bruniquel. (After Cartailhac, *L'Anthr.* × $\frac{2}{3}$.)

(Fig. 281)[1] and on the other that at the close of the

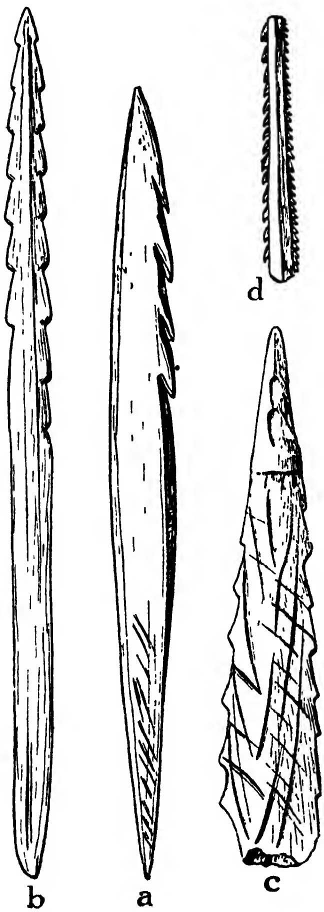


FIG. 281.—Rudimentary harpoons from the Lower Magdalenian, stage 4. *a*, With one row of barbs from Mas d'Azil, after Piette; *b*—*d*, with two rows of barbs; *b*, from Laugerie Basse; *c*, from St. Michel d'Arudy; *d*, from Mas d'Azil. (All from Breuil. $a \times \frac{3}{4}$; $b, c, d \times \frac{1}{2}$.)

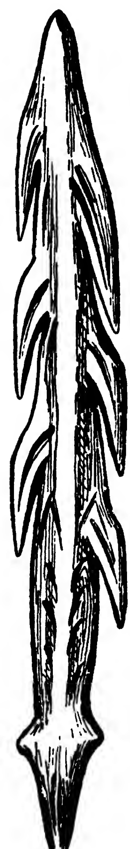


FIG. 282.—Harpoon from the last stage (6*b*, Breuil) of the Magdalenian. La Souci (Lalinde). (After Breuil. $\times \frac{2}{3}$.)

[1] H. Breuil, "Les subdivisions du paléolithique supérieur," *loc. cit.*, pp. 210, 211.

Magdalenian (stage 6, Breuil) the harpoon with a double row of barbs assumed its final form (Fig. 282).

The simple forms of arrow-head and spear-head which came in with the first stage, but persisted throughout the remainder of the period, are more or less cylindrical rods of various dimensions, terminating at one end in a conical point, and at the other in a base for attachment to the shaft. The base is fashioned in several different ways: very commonly by slicing off the head obliquely to its length, so as to afford a surface for making a simple splice with the shaft (Fig. 279, 1, 8); sometimes, though almost exclusively in deposits of the first stage, it is excavated by a wedge-shaped fissure (Fig. 279, 3),[1] evidently intended to fit on to a shaft with a correspondingly wedge-shaped extremity; more generally this last relation is reversed and the base forms a solid wedge, which was probably inserted into a slit at the end of the shaft (Fig. 279, 9, 10). In a few rare examples the wedge is converted into a tongue by which a shouldered joint is produced, but the shoulders are always round, never square. There is no better joint, so far as security is concerned, than the square shoulder: it is the kind exclusively adopted by the Eskimo and some other hunting tribes at the present day, but it was not invented in Magdalenian times. The union of the head with the shaft was no doubt secured by threads of sinew tightly bound round the joint. Finally, there are some simple points with a base which truncates the head transversely (Fig. 279, 6, 7) and some with a pointed base (Fig. 279, 2); possibly with a view to providing a loose joint, so that the head might readily

[1] This has been confused by some authors with the Aurignacian point (*à base fendue*), from which it differs both in form and function. The most marked distinction is afforded by the base, which is simply split in the Aurignacian implement, but deeply notched by sawing in the Magdalenian point.

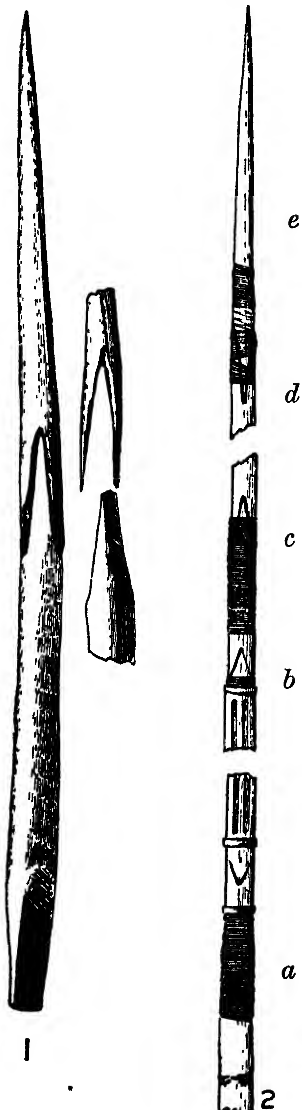


FIG. 283.—1. Composite head of a lance in deer's horn of Upper Magdalenian age from the Cueva de la Paloma, Asturias, Spain. (After Obermaier.) 2. Composite lance from Mallicolo, New Hebrides. *a*. A reed (bamboo ?) shaft; *b*, intermediate piece of hard wood; *c* and *d*, intermediate pieces of bone; *e*, bone-point. (After Passemard.)

break off in the wound, its connexion with the shaft being maintained by a loose cord; but as no provision is made for the attachment of such a cord it is more likely that we have to do simply with a peg and socket joint. There is another contrivance of which examples are described by M. Passemard [1] from the South of France and by Dr. Obermaier [2] from Asturias. In this an additional piece is introduced between the shaft and the head as shown in Fig. 283, 1. This recalls the additional loose segment in the Eskimo harpoon, but there is no real resemblance; the nature of the joints shows that they were intended to secure a rigid connexion, and a parallel is supplied, as suggested by M. Passemard, by some lances from the island of Mallicolo, New Hebrides (Fig. 283, 2). The skill required to produce these joints with a flint implement must have been great, but it probably ensured an economy of time and material. M. Passemard remarks that although the points show evidence of rough usage, being often broken, the jointed ends are usually found intact.

Both arrow-heads and spear-heads, especially the latter, are usually adorned with some simple incised design, such as a series of transverse lines, zigzags, or scroll work. These, as Lord Avebury pointed out in the case of Eskimo weapons, may have served as a means of identification. Such marks of ownership are commonly met with on the arrows of existing wild races; they provide a useful arbiter in the settlement of disputes, such as arise from time to time in battle or the chase. In the illustration (Fig. 333 on the right, p. 385), taken from a drawing made by an Eskimo, two Eskimo hunters are represented as quarrelling over the carcase of a

[1] E. Passemard, "Sur les Pointes de Sagai Fourchues," *Bull. Soc. Préhist. Française*, February, 1917.

[2] H. Obermaier, *El Hombre Fósil*, p. 123.

walrus which one of them has slain; in their anger they seem to have forgotten that the arrow bears the owner's mark. There are other characters of a different kind (Fig. 284) inscribed on weapons or other bone objects, which have been interpreted by Piette as some kind of script. It is possible that these also are ownership marks. We must be careful, however, not to push this explanation too far, for it is now known that the marks on the weapons of some existing hunting tribes, as for instance the Eskimo, are intended primarily to indicate not ownership but the totem to which the owner belongs (Fig. 285.)[1]

Fig. 284.—Problematical characters, supposed by Piette to be primitive writing. From Rochebertier, Vilhonneur, Charente. (After Piette, *L'Anthr.*, 1905, p. 9.)

Some of the simple points are scored with a deep longitudinal groove, sometimes called the blood-channel; it has been suggested that this may have been intended to carry poison. In this connexion it may be mentioned that some of the interior tribes of British

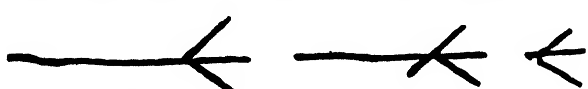


Fig. 285.—Simple forms of the raven totem in use among the Eskimo of Bering Strait. (After E. W. Nelson.)

North America make use of poisoned arrow-heads. The poisons are of various kinds, that obtained from the fangs of the rattlesnake being the most commonly used and the most deadly.[2]

[1] E. W. Nelson, "The Eskimo about Bering Strait," *Rep. Bureau of Am. Ethnology*, 1899, Pt. I, p. 324.

[2] C. Hill Tout, *British North America*, p. 132: London, 1907. Arrows

The simple point presented itself almost ready-made as one of the prongs of the reindeer's horn; the harpoons of the succeeding stages required more elaborate workmanship. The form with uniserial barbs often ends below in a conical point bevelled on one side only (Fig. 279, 4), and in some cases two or three of these heads may have been bound together at the end of the shaft to form a bident or trident for spearing fish. In some well-made examples from Castillo, in Santander, a perforation exists near the base—no doubt intended for a connecting thong (Fig. 286).

FIG. 286.—Harpoon heads with perforations for attaching a thong. From Castillo, Santander. (After Hermilio Alcalde del Rio. × ½.)

The harpoons with biserial barbs take a great variety of forms, and near the base frequently swell out into an annular ridge, or two opposed lobes, before terminating in a blunt cone (Fig. 280 A). This is certainly suggestive of a loose union with the shaft, and in one instance the upper angles, where the lobes spring from the head, are deeply incised as though to afford a notch for attachment. The double-barbed harpoons of the Azilian stage, which succeeded the Magdalenian, are often perforated with a fairly large hole, obviously intended for the passage of a leathern thong.

poisoned with urari are used in Central and Southern America; the Ainos of Japan and some of the tribes of New Guinea, Java and Borneo also use poisoned arrows (W. J. Hoffman, "Poisoned Arrows," *Am. Anthrop.*, 1891, p. 67), so in ancient history did the Scythians (Aristotle).

No bows have been discovered in any Magdalenian deposits; this weapon, if it existed, as it almost certainly did, was in all probability made of wood. Some of the simple bone-points are of such comparatively small size that they could not have served for spears, and can only be interpreted as arrow-heads.

Whatever doubts may be entertained as to the existence of the bow, there can be none as to the "pro-

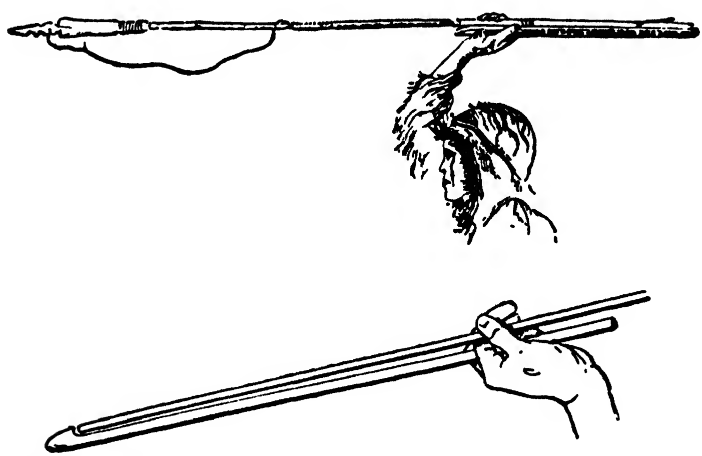


FIG. 287.—The upper figure shows how the spear-thrower is used by the Eskimo, the lower one by the Australian.

pulseur" or spear-thrower, an instrument as we have seen still in use among the Australians as well as several other wild hunting tribes, including some who at the same time are also in possession of the bow. The spear-thrower reduced to its simplest terms is a stick with a recurved tooth at one end; the spear is laid parallel with the stick, its butt-end resting against the tooth. It is differently held by different races; the Eskimo rest it between the root of the forefinger and thumb, the ends of these digits holding the spear (Fig. 287). By a

sweeping movement of the wrist and forearm the spear is discharged, and as the fingers close over the handle of

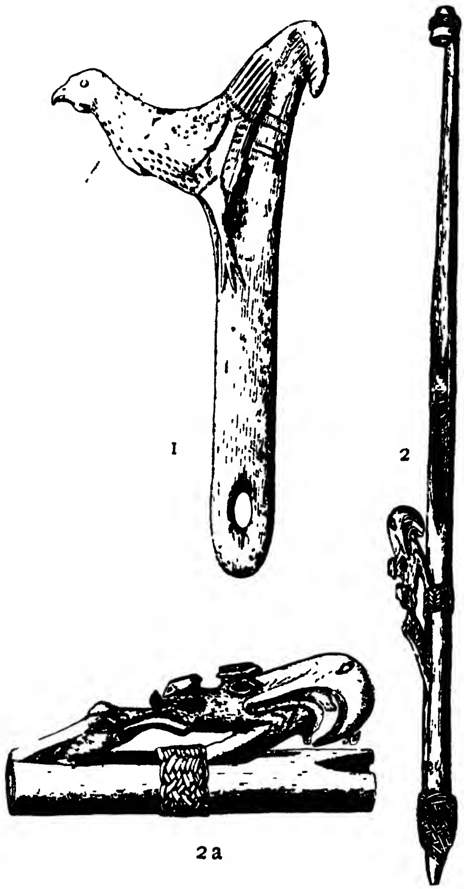


FIG. 288.—Spear-throwers. 1. Magdalenian, with a "cock of the woods" for a "figure-head" sculptured in reindeer's horn. (After Breuil. × ⅓.) 2 and 2*a*. Recent, from Augusta river, New Guinea. (After Von Luschan.)

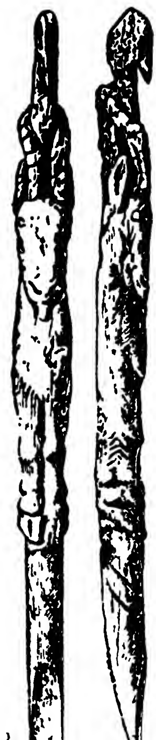


FIG. 289.—Throwing-stick in ivory, from the Magdalenian of Mas d'Azil. (After Piette. × ½.)

the throwing-stick this is swept forwards with great force and rapidity, following and accelerating the spear in its flight. A great number of Magdalenian spear-

throwers have been discovered, chiefly in the caves of Dordogne; as many as thirty-four examples are known from the Middle Magdalenian of Laugerie Basse. They are carved in one piece out of bone or ivory, and adorned with engravings or finely sculptured after some kind of animal. The sculptured figure is usually placed at the distal extremity of the throwing-stick on the side opposite to the tooth which is inserted into the end of the spear (Fig. 288, 1). As a contrast to this we may mention the spear-thrower of New Guinea, where the sculpture is at the handle end (Fig. 288, 2); as an additional peculiarity this spear-thrower has no tooth, but receives the spear in a pit. One of the finest specimens is that represented in Fig. 289—a spirited study of the forepart of an ibex. In its skilful rendering, its vigour and truth, this is a masterpiece of art: we feel that to put it to common use would be a desecration.

FIG. 290.—Simple form of spear-thrower from the Lower Magdalenian of the Placard. (After Breuil. × ½.)

Such forms as this, however, are the later terms of a fairly long evolutional series which commenced with the simple toothed rod (Fig. 290).

A solid ivory cylinder (25 cm. long and 7 cm. thick), the purpose of which is problematical, was found in the löss at Předmost in Moravia, from a supposed Solutrean horizon. It closely resembles in form the diminutive ivory bolas which are used by the Eskimo to catch birds, but it is of much greater size, as large, indeed, as the weight for a "grandfather's clock" and of much the same shape.

There are several objects among the Magdalenian bone implements to which it is difficult to assign a use.

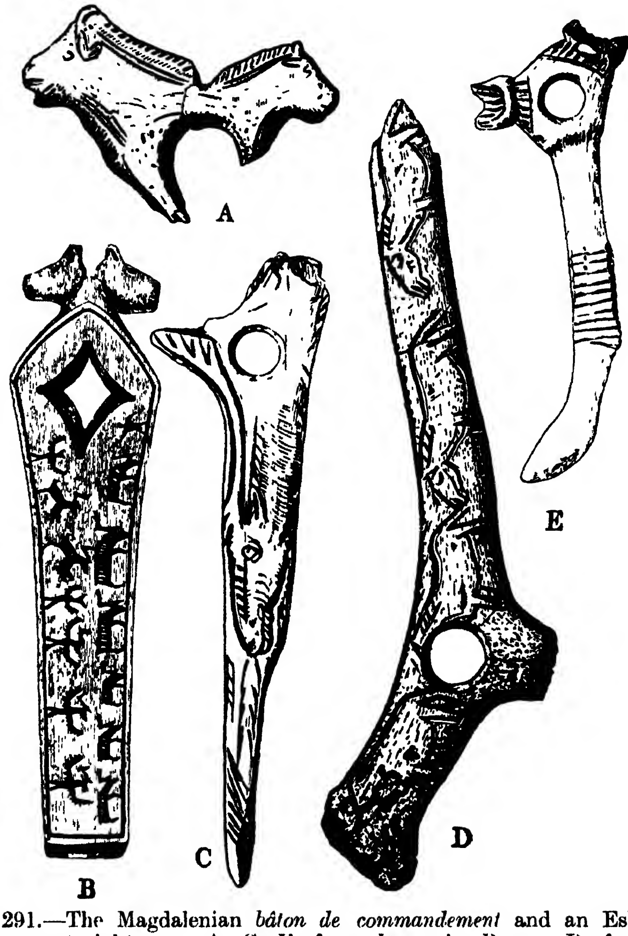


FIG. 291.—The Magdalenian *bâton de commandement* and an Eskimo's arrow-straightener. A, C, E, from Laugerie Basse; D, from La Madeleine. (A, D, after A. de Mortillet. × ⅓. C, E, after Breuil, *L'Anthr.* × ¼ about. B, Eskimo arrow-straightener in walrus ivory, after Boyd Dawkins. × ½. E is a widely distributed type extending from the Pyrenees into Bavaria.)

One of the most interesting of these is the *bâton de commandement*, as it is termed by De Mortillet (Fig. 291).

In its simplest form this is a rod of reindeer's horn, perforated with one or more cylindrical holes; very commonly it consists of a part of the stem of an antler bearing one of the tines or the base of a tine, and the hole is drilled through the expanded region at the angle of branching. We have already met with it in the Aurignacian (p. 365); in the first stage (Breuil) of the Lower Magdalenian it reappears with some feeble attempts at decoration; in the second stage these become more pronounced. Later on it assumes a more elaborate character, and is adorned with incised designs. In several instances the extremity just beyond the perforation is sculptured to represent two heads adossée (Fig. 291 A), a motive not infrequently met with in primitive art. In one instance, on the other hand, the two heads, in this case mammoths', are opposed face to face.

De Mortillet's explanation of the *bâton de commandement* is implied in its name, translated "sceptre" by some English writers. One of the commonest forms (Fig. 291 D) bears some resemblance to the club carried by some North American chiefs, and known among them as a *pog-a-magan*, but this always lacks the characteristic perforations. By other authors it has been variously interpreted as a tent-peg, a drum-stick, a magic rod, a trophy of the chase, or part of a horse's bridle; but perhaps the strangest suggestion of all was that of Schoetensack,[1] who regarded it as a rude kind of fibula. This view has been hailed by Dr. Klaatsch [2] as a "glück-

[1] O. Schoetensack, "A quoi servaient les 'bâtons de commandement,'" *L'Anthr.*, xii, p. 140, pl. iii, 1901.

[2] H. Klaatsch, *Weltall und Menscheit*, edited by H. Kraemer, ii, Berlin, no date, p. 276. Prof. Engerrand (G. Engerrand, *Six leçons de Préhistorique*, Brussels, 1905, p. 145) states that the Eskimo still wear similar objects as "fibulæ." This, however, is not the case. An innocent "suggestio falsi" conveyed by Dr. Schoetensack's illustrations is, no doubt, responsible for this error.

licher Gedanke," and it seems to be widely accepted in Germany. That a people who had achieved such a mastery over the carving of bone and ivory as the Magdalenians, and who showed so keen a sense of the appropriate in art, should have fastened their garments by such a clumsy device seems at least unlikely, and expert hunters would scarcely choose to start on the chase with a piece of bone about a foot and a half long dangling round their necks. The Magdalenians were quite capable of making respectable buckles or fibulæ, but they probably fastened their dress in quite another fashion. A more plausible suggestion is that of Herr Pfeiffer [1] who calls attention to the resemblance between the bâton and an implement (*Bieger*, a bender), once made of wood but now of steel, which is used in basket work for bending the withes. In this we have an approach to that which seems to me the true explanation proposed long ago by Prof. Boyd Dawkins,[2] who has compared the bâton with the Eskimo's arrow-straightener. For some reason this view has not been very favourably received by anthropologists either at home or abroad,[3] possibly—though reasons are seldom given—because most of the Eskimo arrow-straighteners exhibited in our museums have been brought from Greenland or other regions where this instrument has obtained its most perfect form and development. Such examples are generally of comparatively small size, skilfully carved out of ivory, and especially distinguished by the form and other characters of the perforation

[1] L. Pfeiffer, "Beiträge z. Kenntniss d. Steinzeitlichen Korbflechterei," *Zeits. f. Ethn.*, xlii, p. 367 *et seq.*

[2] W. Boyd Dawkins, *Cave Hunting*, London, 1874, p. 355.

[3] M. Hoernes, *Der Diluviale Mensch in Europa*, Brunswick, 1903, p. 72. Prof. Hoernes objects that as the Magdalenians were ignorant of the bow they had no arrows to straighten; but they had javelins, and as we now know bows and arrows also.

intended for the insertion of the arrow. This is invariably lozenge-shaped (Fig. 291, B), and, as Mr. H. Balfour points out with just insistence, it passes obliquely through the implement. Both the form and direction of the perforation ensure a good grip of the arrow-shaft, and distribute it in such a manner as to minimise the chances of bruising the shaft during the operation of straightening. In the Magdalenian implement, on the other hand,

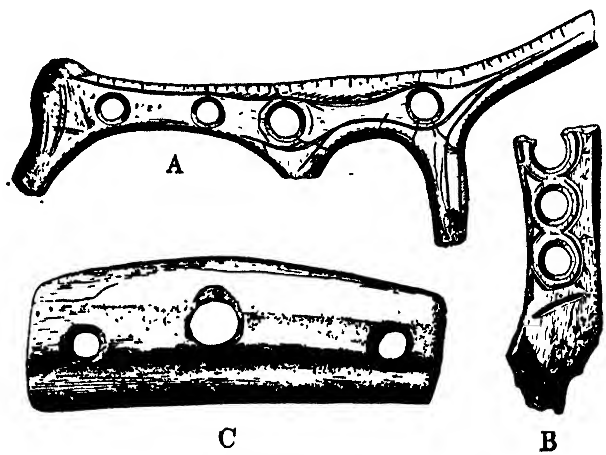


FIG. 292.—A and B, Upper Magdalenian (stage 6, Breuil) shaft-straighteners. C, Eskimo shaft-straightener. A, from La Madeleine. (After Reliq. Aquit.) B, from La Madeleine. (After A. de Mortillet.) C, from Baffin Land. (After Boas.) All × ⅓.

the hole is always circular or cylindrical, and generally takes a straight course, at right angles to the two faces. This difference, which impairs to some extent the usefulness of the Magdalenian implement, seemed to me at one time to offer a fatal objection to the identification suggested by Prof. Dawkins [1]; but it now appears that the Greenland form, with which we are most familiar, is not universal among the Eskimo. Boas has

[1] Prof. Dawkins (*loc. cit.*) attributes the difference largely to friction due to use. I am afraid this explanation is not supported by the facts.

figured an example from Baffin Land, in which the hole is cylindrical, and apparently takes a direct and not an oblique course. Between this and the Magdalenian bâtons there is no essential difference; both are arrow-straighteners.[1] There are some other Magdalenian implements (Fig. 292 A, B) perforated by several holes which I should have regarded as problematical, but for

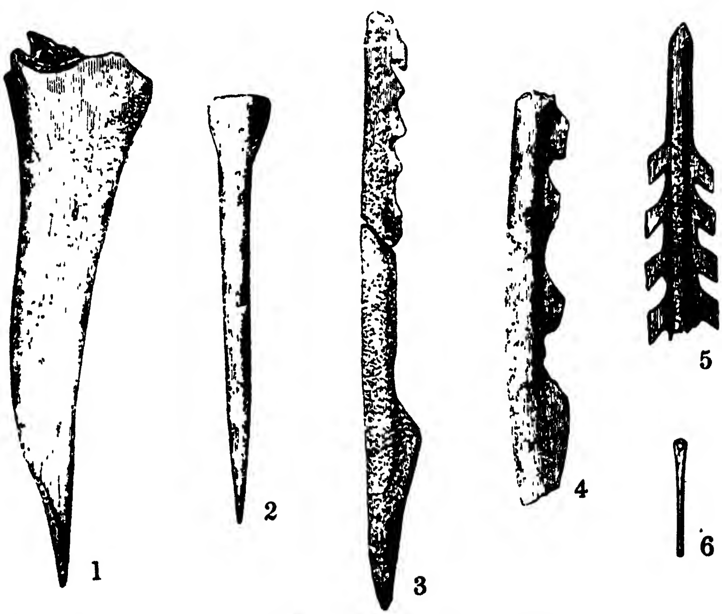


FIG. 293.—Bone implements from the Magdalenian of Kent's Hole, Torquay. 1, Awl; 2, pin or taa-poo-ta; 3 and 4, fragments of harpoons with uniserial barbs; 5, part of a harpoon with biserial barbs; 6, a broken needle. (After Sir John Evans. × $\frac{5}{11}$.) The Abbé Breuil would refer the bone pin (2) to the Aurignacian: this industry was well represented in Kent's Hole; numerous characteristic grattoirs are preserved in the Torquay Museum.

the fact that Boas also describes a piece of bone, similarly perforated, as an arrow-straightener, and expressly mentions that it is provided with several holes of various

[1] Or more strictly "shaft" straighteners, for in many cases the holes are too large for arrows though well adapted to lances. See *ante*, p. 365.

diameters in adaptation to the various thicknesses of the arrow-shafts [1] (Fig. 292 C).

Although the Greenland arrow-straightener is a much superior instrument to the Magdalenian, yet a remarkable resemblance may sometimes be traced in their decorative form, the heads adossée already referred to as a motive

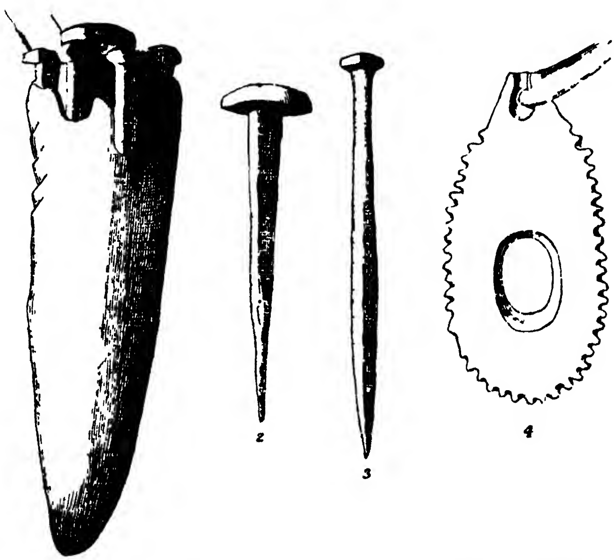


FIG. 294.—Bone implements used by the Eskimo in East Greenland. 1, a set of taa-poo-tas carried in a leather case or quiver; 2, the central taa-poo-ta of the set, which partly by reason of its larger head helps to keep the rest in place; 3, one of the other taa-poo-tas; 4, part of a buckle. These with other implements are all carried attached by leathern thongs to a leathern bracelet.

in Magdalenian art being a frequent feature in the Eskimo examples (Fig. 291 B). In both cases also the handle of the straightener is frequently incised with line engravings representing animal forms.

As connected with the chase, we may mention the bone pins not uncommonly met with in Magdalenian

[1] Franz Boas, "The Eskimos of Baffin Land and Hudson Bay," *Bull. Amer. Mus. Nat. Hist.*, xv, p. 84, fig. 117, New York, 1901; W. J. Sollas, *Nature*, lxxiv, p. 372, fig., 1906.

deposits (Fig. 293, 2). These, though inappropriately thick, are supposed to have served for dress-fasteners; but it is extremely unlikely that a people, who were evidently adepts in the art of sewing, would show so great a disregard for valuable skin garments as to drive such rude pegs as these "pins" through them. We shall find a more probable explanation by reference to the Eskimo, who possess similar pins (Fig. 294, 2, 3),

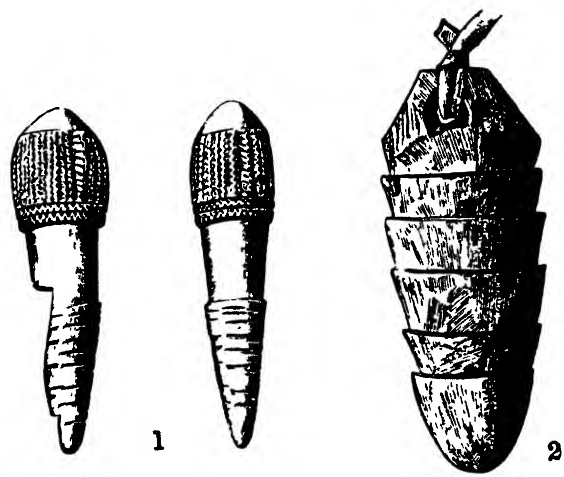


FIG. 295.—1. Ivory peg from Brassempouy. [Now assigned to the Aurignacian.] (After Piette, *L'Anthr.* × ½.) 2. Wooden peg used by the Eskimo to stop the wounds made by their spears. (After Boas. × ½.) The notch on the left-hand side of the first figure is due to subsequent fracture.

which they call "taa-poo-ta," and use for skewering together the sides of the wounds inflicted in killing seals or other large animals, with the object of securing the blood, not a drop of which is willingly lost.[1] The Algonkian Indians, who live inland, next to the Eskimo, have the same custom. Occasionally the Eskimo make use of a bone plug instead of the "taa-poo-ta"; it is inserted in the wound as a kind of stopper (Fig. 295, 2).[2]

[1] "On some Eskimo Bone Implements from the East Coast of Greenland," *Journ. Anthr. Inst.*, ix, pl. vii, 1880. [2] F. Boas, *loc. cit.*

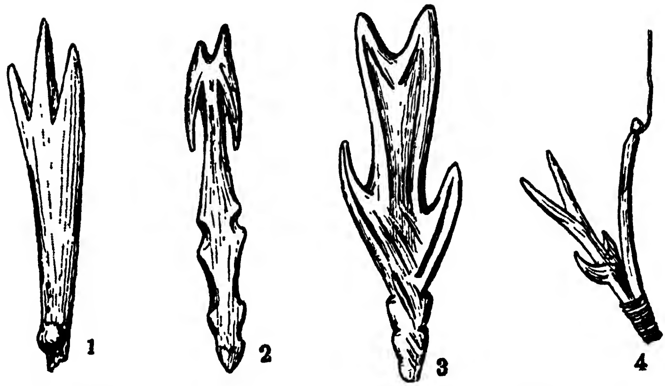


FIG. 296.—Magdalenian bone implements, supposed to be fish-hooks. 1, from Fontarnaud, Gironde, × nearly ½; 2 and 3, from Bruniquel, × ⅔; 4, supposed mode of attachment. (After Breuil, *L'Anthr.*)

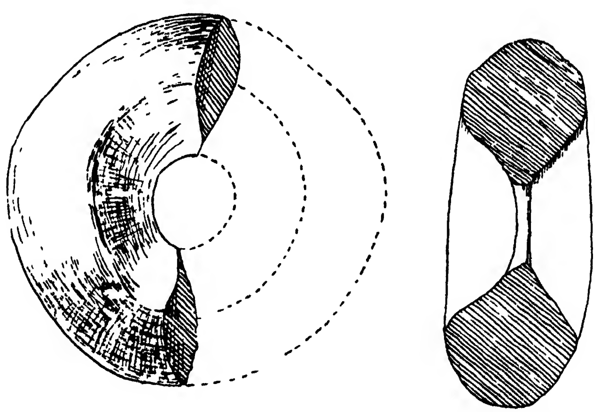


FIG. 297.—A perforated stone, probably used to load a digging-stick, from Salpétrière. (After Cazalis de Fondouce. × ½.) That the Magdalenian women contributed the vegetables to the family meals is suggested by the discovery at Salpétrière of a perforated stone very similar in size and shape to those used by the Bushmen and most other hunting tribes to give weight to their digging-sticks. Many other stones excavated on one or both sides,[1] but not perforated, have been found in Magdalenian deposits elsewhere, and it is possible that some of these are unfinished ring stones, abandoned by their owners in a time of panic.

[1] See *Reliquiæ Aquitanicæ*, pl. A. XIII.

An ivory peg figured by Piette from Brassempouy, with the remark "use unknown," may perhaps have served the same purpose (Fig. 295, 1).[1]

Whistles made from the phalange of a reindeer, such as are in use among North American Indian tribes, have

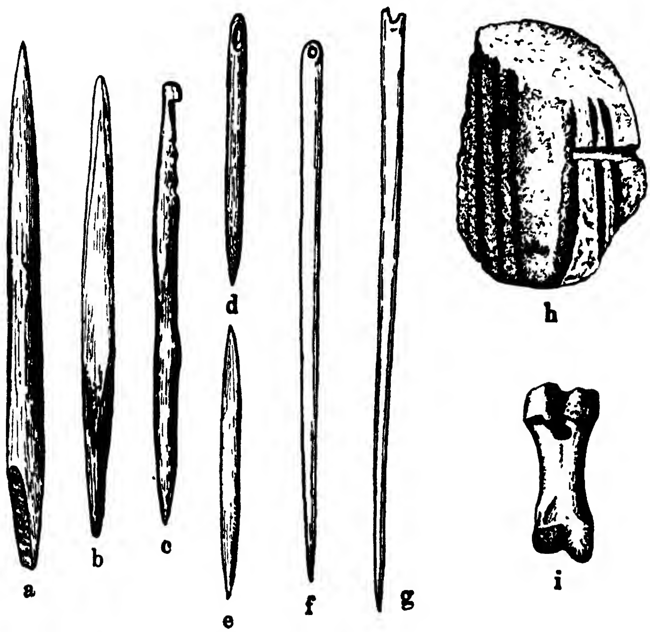


FIG. 298.—Magdalenian implements, all but *h* in bone or ivory; *a*, arrow-head; *b* and *e*, gorges; *c*, a bodkin; *d*, *f*, *g*, needles, *g*, with a broken eye; *h*, a grooved piece of sandstone for rubbing down bone needles; *i*, perforated phalange of a reindeer used as a whistle: *a* to *e*, from Garenne, × ½, after Breuil; *f* and *g*, from Dordogne; *h*, from Massat, Ariége, after Rel. Aquit., × 4/7; *i*, from Bruniquel, after De Mortillet, × ½.

been found in Magdalenian deposits of several caves (Fig. 298 *i*).

The Magdalenians were evidently fishermen as well as hunters. Some of the barbed harpoons were doubtless used for spearing fish, but the hook and line were not

[1] Piette, *L'Anthrop.*, vi, p. 135, fig. 6.

unknown; some curious little bone implements with prong-like barbs (Fig. 296, 1, 2, 3) have been interpreted by the Abbé Breuil as fish-hooks (Fig. 296, 4). Small rods of bone sharply pointed at each end (Fig. 298, *b*, *e*) also served the same purpose; similar rods, which are known as "gorges," are still in use amongst the Eskimo

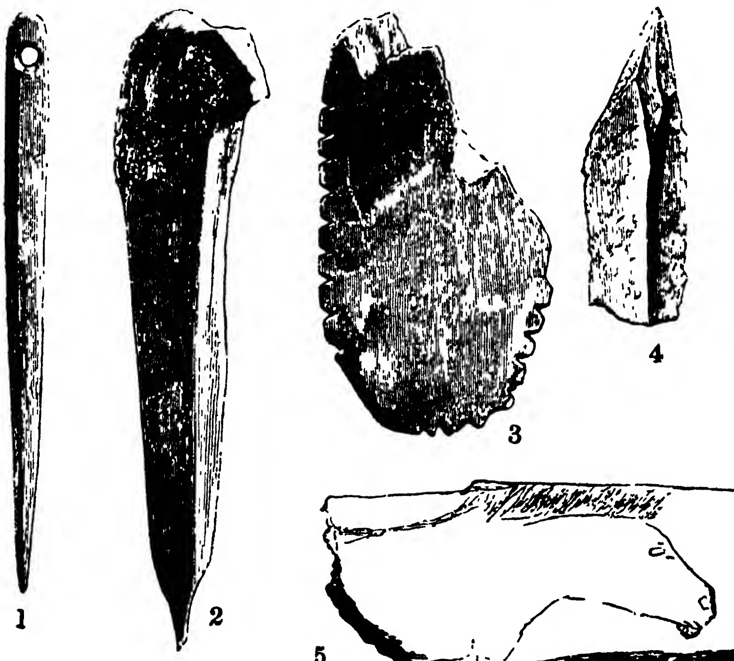


FIG. 299.—Implements from the caves at Creswell Crags. 1, bone needle; 2, bone awl made from the tibia of a hare; 3, notched bone; 4, flint burin; 5, part of figure of a horse engraved on the smoothed surface of a rib.[1] 1—3, from Church Hole Cave; 4, 5, from Robin Hood Cave. (All nat. size. From Sir John Evans, after Boyd Dawkins.)

[1] There is a singular absence of any attempt at art in all the Palæolithic stations of England. The horse figured here is, I am assured, a forgery introduced into the cave by a mischievous person; the horse described by Dr. Smith Woodward is a forgery perpetrated by some schoolboys. The ten red bands (Fig. 300) described by the Abbé Breuil and myself from Bacon's Hole, South Wales, are genuine, but they cannot be regarded as "art." The gentleman who was responsible for circulating some untruthful stories on the history of these bands has expressed his regret in a very handsome apology and explained that he was himself deceived.

and other tribes at the present day. The gorge when swallowed with the bait enters the fish lengthwise, but when pulled upon afterwards by the line it turns round and lying athwart the gullet hold its victim as firmly as a hook.

A variety of evidence leads to the conclusion that the clothes of the Magdalenian people were made from the skins of animals killed in the chase; the reindeer probably furnished some of the warmest and most resistant to the weather. That these, after dressing and trimming, were sewn together is suggested by the abundant bone needles which are found strewn through Magdalenian deposits (Figs. 293, 6; 298, *d*, *f*, *g*, 299, 1). The needles are remarkably well made, straight and slender, with sharp points and round or elongated eyes. Their variety in size—the length ranging from 37 to 72 mm.—seems to show that the seamstress was particular as to the fineness of her work. In making a needle the first step was to obtain splinters of bone from a reindeer's shoulder-blade, or to cut strips out of the cannon-bone of a horse or deer; these were then scraped into shape with a flint flake, rubbed smooth and pointed on a grooved piece of sandstone (Fig. 298, *h*), and finally drilled by means of a delicately chipped flint awl. The awl was no doubt mounted in some manner, probably by binding it with sinew on to a rod of wood or bone.

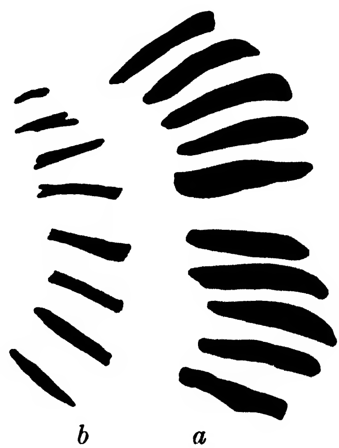


FIG. 300.—*a*. Red bands from Bacon's Hole, South Wales; *b*. From Font-de-Gaume for comparison.

In drilling holes for shaft-straighteners a large flint borer was necessary, and the question arises whether any accessory apparatus was used, such as the bow-drill, so common among many primitive people at the present

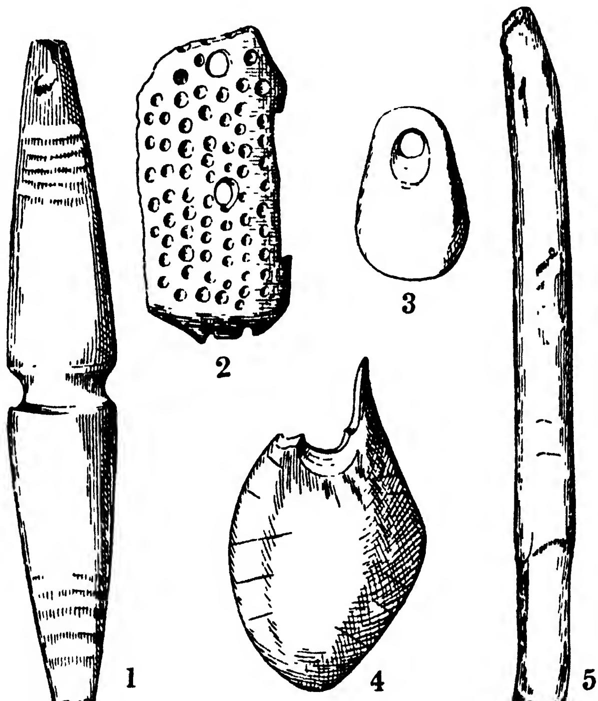


FIG. 301.—Magdalenian implements from the mammoth cave of Wierzchovie, Poland. 1, Handle in reindeer horn for attachment to a cord—similar handles are in use among the Eskimos and the natives of Vancouver Island; 2, an ivory plate pitted and perforated; 3 and 4, ivory pendants; 5, mammoth rib with a handle carved at one end, probably used as a snow-scraper. (After Count J. Zawisza.[1] 1—4, $\times \frac{7}{8}$; 5, $\times \frac{1}{8}$.)

day. The Eskimo use an ivory bow-drill, and if a similar implement had been known to the Magdalenian men we might expect to find examples preserved in the cave

[1] Count J. Zawisza, "La Caverne du Mammouth en Pologne," *Mém. Soc. Anthr. Paris*, 1873, i, p. 439, pls.

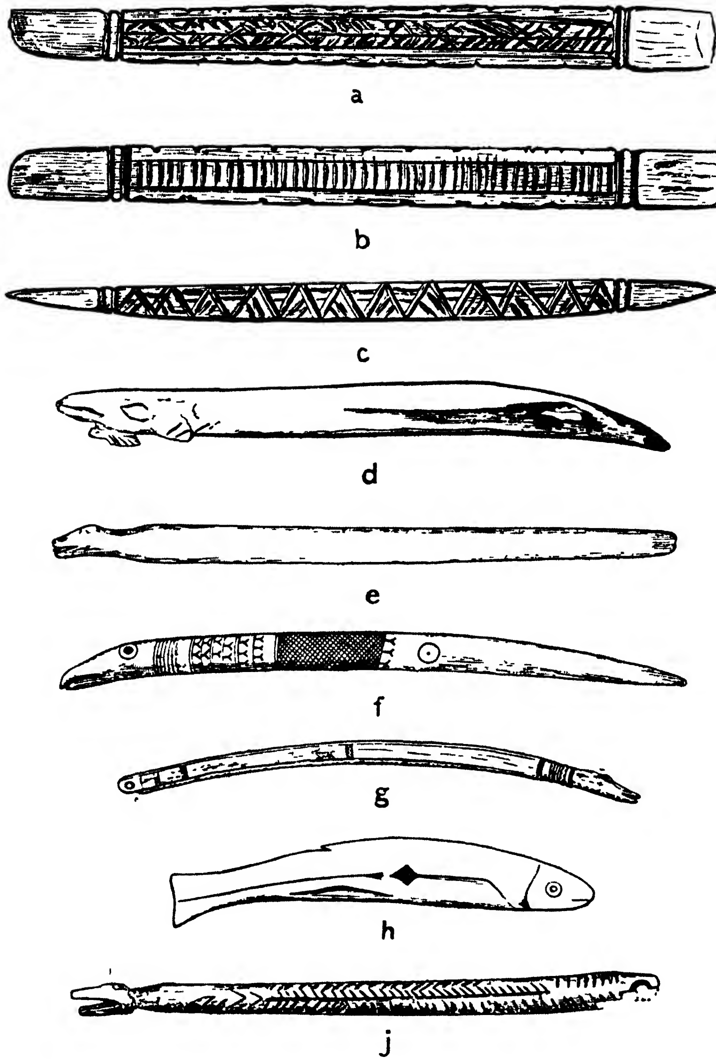


FIG. 302.—Magdalenian and Eskimo implements in bone and ivory. *a*, *b*, *c*, an ivory chisel seen from two faces, *a*, *b*, and one side, *c*, from Saint Marcel (after Breuil, × ½); *d*, an ivory rod with a fish-like head, from Mas d'Azil (after Piette, × ½); *e*, Eskimo sinew-twister in Pitt-Rivers collection, Oxford (× ½); *f*, Eskimo chisel for working wood, from Ikogmut, Bering Strait (after Nelson, × ¼); *g*, Eskimo bow-drill, from Norton Sound (after Hoffman, × ½); *h*, Eskimo rod for fastening a bag, from Agiukchugumut, Bering Strait (after Nelson, × ½); *j*, Magdalenian bow-drill (?), stage 6, Breuil (after Breuil. × ½).

deposits; none, however, have so far been identified. The bow is not the essential part of the bow-drill, but merely a mechanical refinement, ensuring that the bow string is maintained in uniform tension. The string, twisted round the borer, may be employed alone, its ends being held one in each hand and pulled alternately in opposite directions. This simple method of obtaining rotation, which still survives among various wild tribes, may have been used by the Magdalenians; though it is by no means impossible that they had already invented the complete bow-drill. Indeed, among the numerous ivory rods of the Magdalenians, there are some, to which as yet no purpose has been ascribed, that closely resemble the Eskimo bow-drill, as for instance the fish-like rod shown in Fig. 302, *d*. In style and artistic motive this is thoroughly Eskimo (*cf.* Fig. 302, *e* to *h*). It is perforated at the tail end by an elongated hole, but there is no second perforation; this, however, is also the case with some Eskimo bow-drills. A still more similar form is shown in Fig. 302, *j*; this not only bears a perforation at one end, but a groove and a notch at the other, and thus strongly recalls some of the Eskimo examples; a comparison may indeed be made with *g*, Fig. 302. Other rods of similar form, but destitute of a hole, are used by the Eskimo as sinew-twisters for bow strings, or as chisels for working in wood or splitting walrus hides, or again as handles for bags. The rectangular rod shown in Fig. 302, *a*, *b*, *c*, has been described, no doubt correctly, as a Magdalenian chisel; it is certainly far more like a chisel than a bow-drill.

Domestic utensils are not numerous.[1] The most

[1] We cannot include among these some gruesome cups or basins fashioned out of human skulls found in the cave of Placard. They were possibly made extempore for some barbarous orgy. See Breuil and Obermaier, *L'Anthr.*, xx, p. 523, 1909.

important yet discovered is a shallow bowl, made out of a pebble of fine close-grained sandstone, which was found in the cave of La Mouthe, Dordogne.[1] It lay in a Magdalenian deposit, which was separated by a layer of stalagmite from the overlying Neolithic stratum. It is oval in outline (Fig. 303) and produced at one side

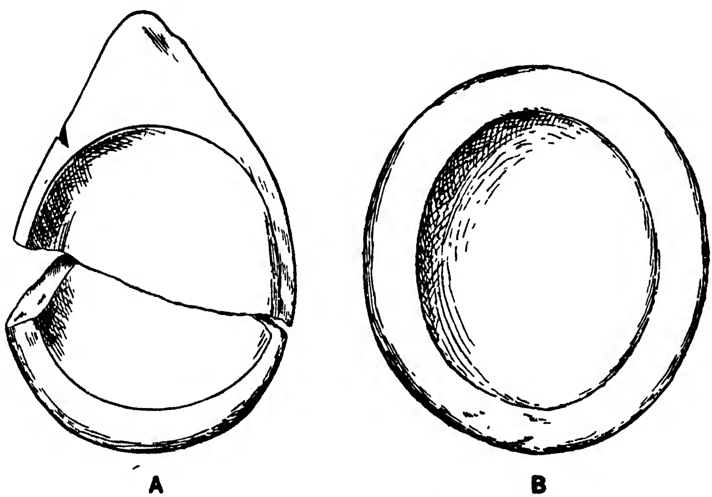


FIG. 303.—A, a sandstone lamp from the Magdalenian of La Mouthe (after Rivière, × $\frac{1}{3}$); B, an Eskimo stone lamp for comparison, from Kadiak Island (after Hough,[2] × $\frac{1}{3}$).

into a kind of shelf or handle; the base is engraved with a rough sketch of the head of an ibex. It has been interpreted as a lamp, and it is certainly not unlike some of the stone lamps used by the Eskimo to warm and light their winter houses. It has evidently been used, for at the bottom of the bowl there still remains some carbonaceous matter. Some of this was

[1] Émile Rivière, "La lampe en grès de la Mouthe," *Bull. de la Soc. L'Anthr. de Paris*, 1899, p. 554, and "Deuzième note sur la lampe de la Mouthe," *op. cit.*, 1901, p. 624.

[2] W. Hough, "The Lamp of the Eskimo," *Ann. Rep. Smithsonian Institute*, 1896 (1898), pp. 1027–1057.

submitted to M. Berthelot for chemical analysis and he reported that it much resembles the residue left by the combustion of animal fat, such as suet or lard.[1]

We have already made a passing allusion to the fact that the mural paintings which date from Aurignacian times are generally found in remote recesses of the caves, far from the entrance, where the light of the sun never reaches. Various explanations have been offered for the problem which thus arises; but artificial illumination is the only one which meets the case. It has been objected that no signs of smoke are to be seen on the walls of the caves. The fact, however, that no smoke is given off by the Eskimo lamps when they are properly tended (see p. 576) completely disposes of this difficulty. The ibex on the bottom of the lamp of La Mouthe resembles in style an ibex which is engraved on the wall of the cave, a further confirmation, if such were needed, of the Magdalenian age of some of the mural drawings.

Another inference may be suggested by this and other lamps subsequently found. If they illuminated the walls of the caves sufficiently well for the artists to do their work they must have emitted a considerable amount of heat; the primary purpose of the Eskimo's lamp seems to be the production of heat (see p. 576); thus the caves may have been converted into comparatively comfortable winter quarters.

There is reason to believe that the Magdalenians were not wholly dependent on caves for shelter; for among the enigmatical signs already alluded to as accompanying many of the mural pictures (p. 411) there are some, known as "tectiform" and of Magdalenian age, which have been interpreted as tents or wooden huts (Fig. 304).

[1] Berthelot, *C. R. Ac. Sci.*, 1901.

Personal ornaments have been found in great variety. In addition to the teeth of bear, horse, and reindeer,

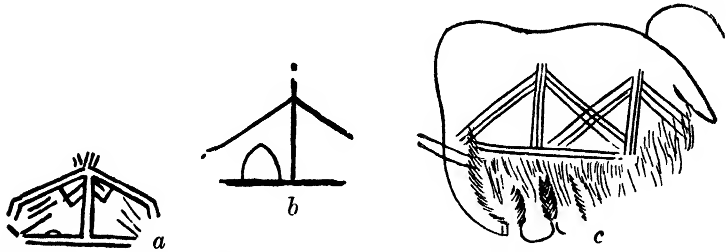
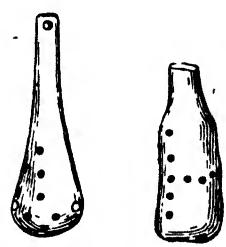


Fig. 304.—Tectiform signs. *a*, *b*, from Font-de-Gaume; *c*, on the flank of a Mammoth, from Bernifal. (After Capitan and Breuil. Greatly reduced.)

sea-shells,[1] and even fossils, all perforated for suspension, we encounter pendants of various forms carved out of bone or ivory, some of which are of especial interest on account of their precise resemblance to similar ornaments in use among the Eskimo, who attach them to needle-cases, housewife bags, and sometimes as tassels to their dress. Long, thin bone or ivory rods also occur, very carefully shaped and bearing incised designs; some of them closely resemble in form and ornament the hairpins still in use among the Eskimo. A small, broken ornament with little pit-like markings (Fig. 305 B), found in the Magdalenian of Kulna,[2] Moravia, recalls some objects of unknown use which the Eskimo women carry attached to their "housewives" (Fig. 305 A).



A B

Fig. 305.—A, An ivory pendant from an Eskimo chatelaine preserved in the Pitt-Rivers Museum, Oxford (nat. size); B, a similar object, but broken, from Kulna, Moravia. (After Hoernes. $\times \frac{4}{5}$.)

[1] Some of these were brought far inland from the Mediterranean both in Magdalenian and Aurignacian times.

[2] J. Kříž, *Casopis muzejniho Spolken v Olomuci*, taf. xiv.

It is in the Magdalenian that the art of the Palæolithic epoch attained its highest development. The sculpture of implements and other objects in bone and ivory; line engraving, sometimes employed in the decoration of tools and weapons, sometimes in naturalistic representations of animals on slabs of stone or on the flat surface of bones or flakes of ivory, are the forms in which we first became acquainted with it. Among the most remarkable sculptures of the age are those described by Dr. Lalanne and the Abbé Breuil, from Cap Blanc in the valley of the Beune near Laussel.[1] Here, beneath the frowning ruins of the dungeon-keep of Commarque, runs a little over-hanging cliff, which afforded a shelter to the Palæolithic hunters. The ground at its foot has been carefully paved by them with slabs of stone, and so converted into a "trottoir" about six feet wide. Its face bears sculptured in high relief an admirable frieze of life-sized horses (one is seven feet long) following one after the other in a long train. Above and below the horses are other animals, including oxen and bisons. Fragments of limestone have fallen from the cliff, some of them into the Palæolithic fire-places, where one was found bearing a sculptured bison. The hearths are attributed to the Lower Magdalenian age, though the implements are said to present a very Aurignacian facies. The sculptures were, therefore, in existence in Lower Magdalenian times, if not before. Later discoveries have made us familiar with that other phase of Magdalenian art which culminates in the polychrome pictures on the roof of Altamira. The painted caves are of manifold interest; they were probably not only picture galleries, revealing by an admirable technique the artist's

[1] G. Lalanne and H. Breuil, "L'Abri sculpté de Cap Blanc," *L'Anthr.*, 1911, xxii, p. 385 *et seq.*, pls.

feeling for form and colour, but also temples or magic chambers where primitive religious ceremonies were performed, which inspired the hunter with the expectation of success, if they did not also respond in some degree to that desire towards the divine which was so early awakened in the heart of man.

The notion of a temple is irresistibly suggested by the cavern of Castillo in Santander. Deep in its

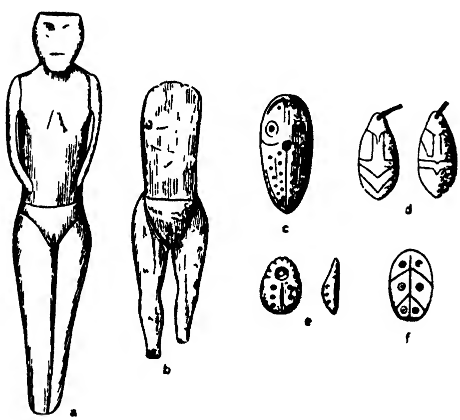


FIG. 306.—Ivory carvings by Palæolithic men and the Eskimo. *a*, a tube carved in the form of a woman, by the Eskimo of the Lower Yukon, Bering Strait (after Nelson); *b*, the Venus impudica of the Aurignacian of Laussel; *c*, a belt fastener, supposed to represent a fish, Eskimo of Nunivak Island, Bering Strait (after Nelson); *d*, a pendant in form of a beetle, Eskimo of Baffin Land (after Boas); *e*, a pendant representing a "lady-bird," from the Magdalenian of Laugerie Basse; *f*, part of an ear-ring, Eskimo, from Nulukhtulogumut, Bering Strait (after Nelson). (All × ½, except *d*, which is × ⅕ about.)

interior we enter a great chamber which, by its beauty and grandeur, cannot fail to awaken a feeling of admiring wonder, almost indeed of solemn awe. In the midst of its dim obscurity shine many pendant stalactites and bosses of mounting stalagmite, and where both have coalesced groups of slender columns soar from floor to lofty roof. Nature had already fashioned

it cathedral-like before its tapestried walls were blazoned with devices by the hand of man.

In the adjacent cave of Pasiega is a small chapel, with paintings that cover its walls, and at one end of this is a natural throne, formed by stalagmitic growth; its arms are worn by use, and on the seat, when explorers first discovered it, lay a Palæolithic implement.

Here, no doubt, was once seated the magician of the tribe!

Fig. 307.—Mammoth engraved on ivory, from La Madeleine. (After Lartet and Christy. × $\frac{3}{8}$.)

But we have already treated at sufficient length the painted caves (pp. 371 *et seq.*), and we may now turn to those other representations with which anthropologists have been longer familiar. The line engravings, sometimes deeply cut, sometimes faintly scratched in, are frequently met with on the sides of bone implements, more rarely on stones; towards the close of the period the designs become conventional and geometric, but the earlier drawings, which are fortunately the most numerous, are faithful delineations of the contemporary animals; one of the earliest discovered is the famous mammoth (Fig. 307) from the rock-shelter of La Madeleine, which has always been regarded with

especial interest, not only as an evidently faithful portrait of an extinct animal drawn from life, but as confirming in an unexpected manner the conclusion obtained from other evidence that Palæolithic man was familiar with this animal in the living state. None of the characteristic features of the mammoth have escaped the artist's observation: the profile of the head,

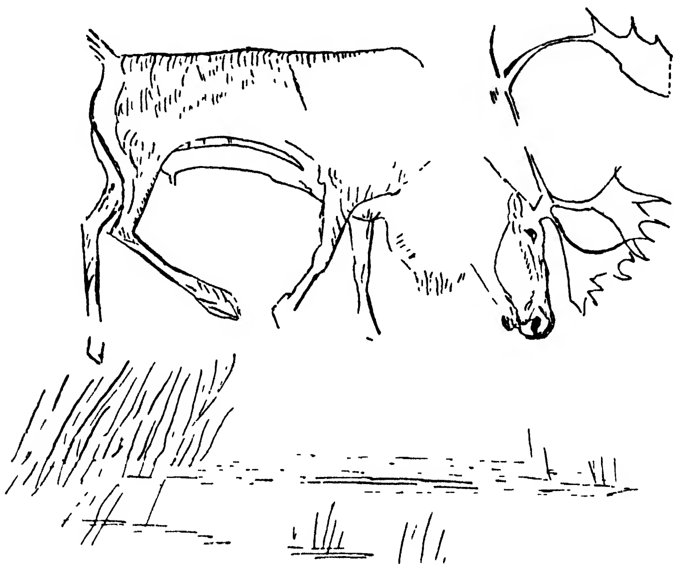


FIG. 308.—The reindeer grazing, from the Kesslerloch, near Thayngen, Switzerland, engraved on a shaft-straightener.[1] (After Merck. Original size.)

the great curved tusks and swinging trunk, the coating of long hair, the mane, the little eye and large, half-opened mouth, and the peculiar gait indicated by the position of the kneeless hind-legs have all been rendered

[1] It should be pointed out that in this and many other instances the illustration as shown here was obtained by "developing" the engraving on the shaft-straightener, *i.e.* by rolling the cylindrical haft over a sheet of plastic material, and thus unrolling the picture on to a plane surface. It is just the same process as was used by the ancient Assyrians in obtaining an impression from their cylindrical seals. The suggestion of herbage and a pool is said not to occur in the original.

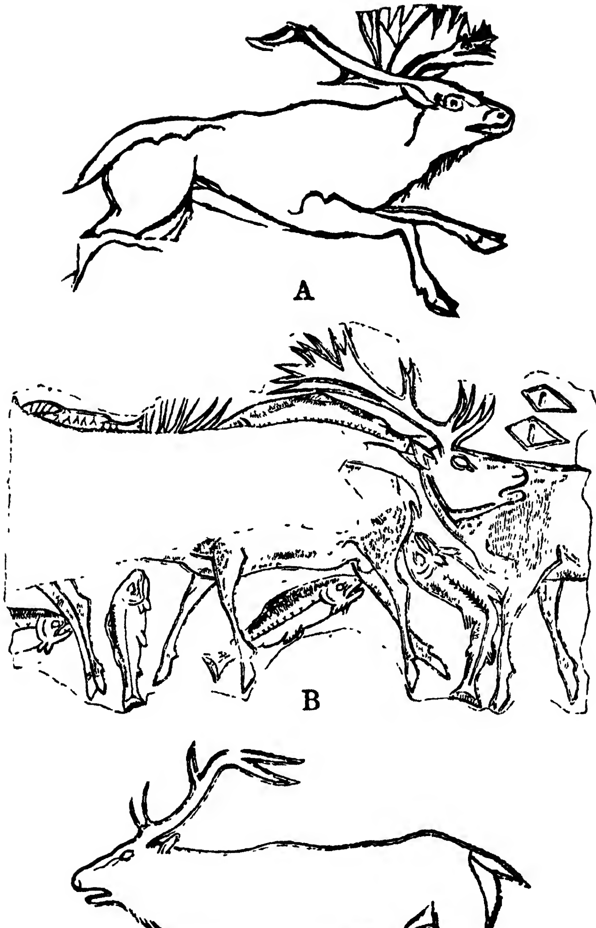


FIG. 309.—A, the running reindeer, engraved on hornblende schist, from Saint Marcel. (From Breuil, *L'Anthr.* $\times \frac{4}{7}$.) B, deer[1] and salmon incised on a piece of stag's horn, from Lorthet, Hautes Pyrénées. (After Piette, *L'Anthr.*, 1894, v, p. 144, fig. 15.) C, The stag (*Cervus elaphus*), on bone, from Lorthet. (After Piette.)

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[1] Mr. H. O. Forbes, in a letter to *Nature* (1910, lxxxiii, p. 125), suggests that these are intended for *Cervus megaceros*, the great Irish deer. This, however, is not the case; they are red deer (*Cervus elaphus*), as Sir Ray Lankester has stated in an interesting article contributed to *The Field* (May 13, 1911).

with convincing truth—so much so that we must apologise to the artist on adding that the fidelity of his sketch is confirmed by independent evidence, afforded by the complete and well-preserved specimens of the mammoth found in the frozen soil of Siberia.[1]

The reindeer is a favourite subject, and has provoked some of the cleverest sketches. A famous masterpiece is the well-known "Reindeer grazing, of Thayngen" (Fig. 308), which was found in the cave of Kesslerloch,

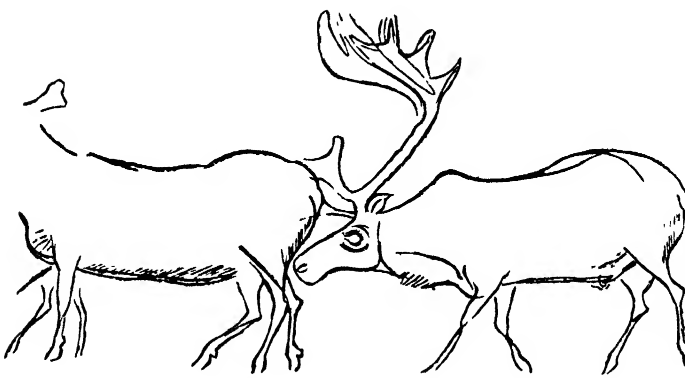

FIG. 310.—The "following" reindeer, engraved on slate, from Laugerie Basse. (From Breuil. × ½.)

near Schaffhausen, Switzerland; another the "Reindeer running, of St. Marcel" (Fig. 309 A); and a third the male reindeer following the female (Fig. 310). The horse, supposed to be of more than one species, is frequently represented, and its frisky colt is drawn in characteristic

[1] Professor Boule after a close examination of the Magdalenian mammoths is impressed by the exact rendering of features peculiar to the species, such as the beaked profile of the face, the elevation of the cranium, the smallness of the ear, the long hairs of the chin and breast, the shortness of the tail, its enlargement at the base to form a kind of anal operculum and its termination in a hairy brush; as well as the two-fingered termination of the trunk, the long eyelashes of the lower eye-lid, and the hairs covering the trunk, characters which were not known before Wollosowitch's discovery of the frozen mammoth of Sanga Jurakl in 1908.

attitudes (Fig. 314, 4). Several studies are known of the bison, and one in particular from Laugerie Basse

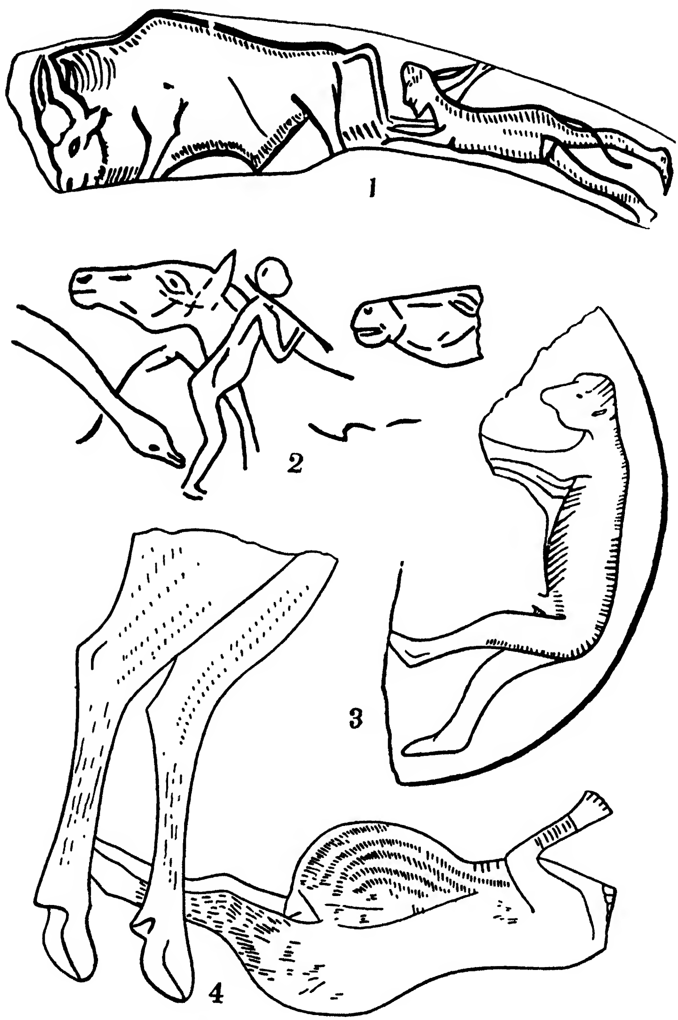

Fig. 311.—1. Man stalking a bison, on reindeer horn, from Laugerie Basse. (After A. de Mortillet. × about ½.) 2. Man carrying a stick, on a fragment of a bâton, from La Madeleine. (About original size.) 3. Ape-like man, on bone, from Mas d'Azil. (After Piette. × ⅝.) 4. Femme au renne, on bone, from Laugerie Basse. (After Piette. × ⅞.)

(Fig. 311, 1) is of special interest, since it represents, not only the bull, but also the Magdalenian hunter, crawling on the ground with a spear in his right hand which he is about to throw. The human figure is not well drawn, so that we cannot tell what kind of man he was; it shows a large, powerful lower jaw with an angular chin, and a curiously peaked roof to the head; a hatching of simple lines represents the hair of the head, and since similar lines are distributed over the legs and body it has been conjectured that these parts of the body also were hairy. Sketches of several other naked human figures are known—as, for instance, the *femme au renne* from Laugerie Basse, and this also shows indications of a growth of hair over the thighs and abdomen (Fig. 311, 4). A broken arrow-straightener from La Madeleine bears a sketch of a standing human figure, evidently naked: it is diagrammatic, but faithful, and shows a complete absence of any tendency to steatopygy (Fig. 311, 2). The profile of a man-like form found at Mas d'Azil is distinguished by such an extraordinary projecting face that Piette thought it might represent an anthropomorphic ape; it has a projecting muzzle not unlike that which we may attribute to Neandertal man, but is without any other features of

FIG. 312.—Man's head carved on reindeer's horn, from Grotte de Rochebertier, Charente. (After A. de Mortillet. × ½.)

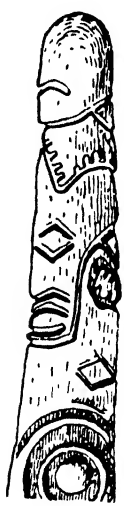

FIG. 313.—End of Rod with conventionalised human head, from Arudy. (After Breuil.)

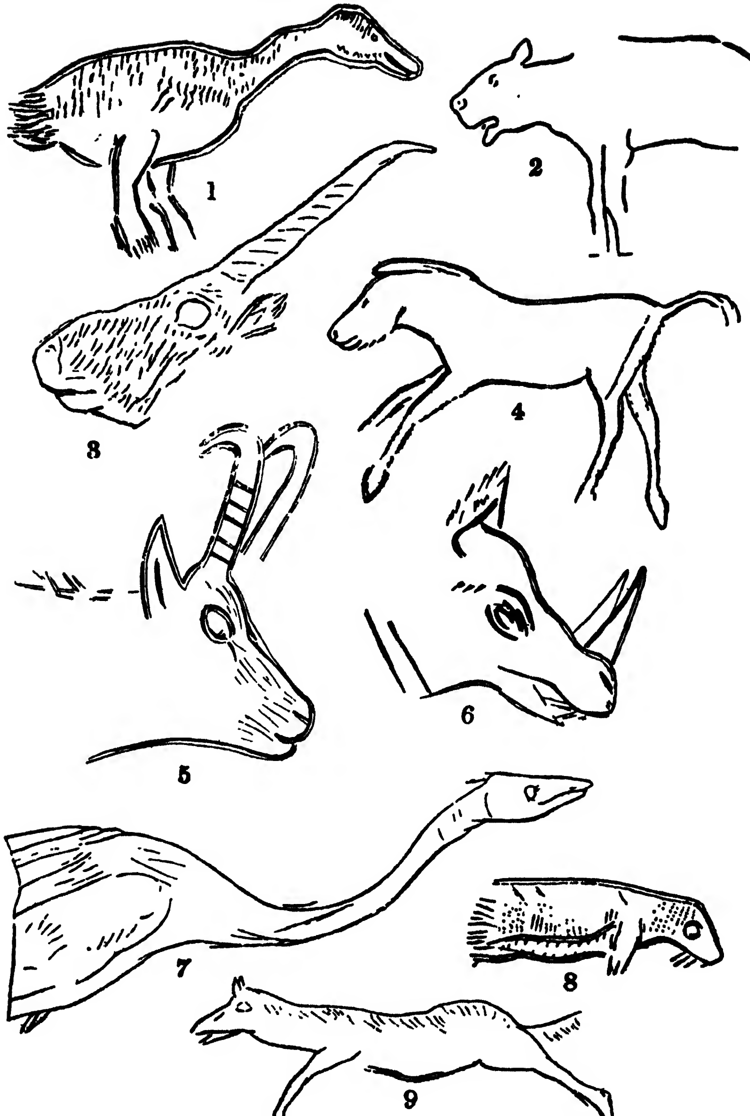

FIG. 314.—1. Goose on reindeer horn, from Gourdan (nearly original size). 2. Some kind of Carnivore on a pebble, from Gourdan. 3. Saiga antelope on bone, from Gourdan. 4. A colt on bone, from Lorthet. 5. Chamois on bone, from Isard. 6. Head of woolly rhinoceros on stalagmite, from Gourdan. 7. Swan on a pebble, from Gourdan. 8. Seal on bone, from Gourdan. 9. Wolf on stone, from Gourdan. (All after Piette, *L'Anthr.*)

resemblance (Fig. 311, 3). A human face with very oblique eyes (Fig. 312) cut on a piece of reindeer's horn found in the cave of Rochebertier recalls the faces which figure on the doorposts of some of the houses of the North American Indians, and we are still more strongly reminded of a totem post by the upper end of the rod from Arudy shown in Fig. 313. Of the remaining animal forms which find representation we may mention the chamois (Fig. 314, 5), Saiga antelope (Fig. 314, 3), seals (Fig. 314, 8), a feline animal (Fig. 314, 2), woolly rhinoceros (Fig. 314, 6), wolf (Fig. 314, 9), horse (Fig. 314, 4), a goose (Fig. 314, 1), a swan (Fig. 314, 7), trout, pike, and salmon: to these we may now add the hare (Fig. 316).[1] An admirable drawing of deer crossing a stream and salmon, in various attitudes, lazily disporting themselves in the water, is reproduced in the illustration (Fig. 309 B). Drawings such as this are rare[2]; other instances are the reindeer grazing and the following reindeer. These are not merely studies of isolated animals, but genuine pictures distinguished by an attempt at composition. Perhaps we should include in the same category the interesting sketch of wild horses (Fig. 315) galloping in troops, as wild horses do,

[1] E. Passemard, *La Caverne d'Isturitz, Basses Pyrénées*, Paris, 1922, p. 37.

[2] Particular attention has been called to it by Sir Ray Lankester (*loc. cit.*), and his remarks led to some valuable comments by Mr. Walter Winans, who was extremely familiar with deer and their ways. He wrote: "I agree that the picture is wonderful—better than anything Landseer or Rosa Bonheur drew . . . one can see by their pictures . . . that *they* knew nothing of deer. The deer are typical red deer . . . except [for the tail, which is too short] . . . they have 'got the wind' of an enemy, have come a long way, and are moving leisurely, the big stag, as usual, bringing up the rear and taking a last look round before the herd goes out of sight. The second is the younger stag, who generally accompanies the big stag and acts as his sentinel when he is sleeping . . . the third is undoubtedly a calf. . . . The stag's mouth is open because he is big and fat and blowing—not roaring. . . . He and the stag in front of him are moving in the real—not the conventional . . . action of a slow, easy canter. . . ."

and following their leader. There seem to be seventeen

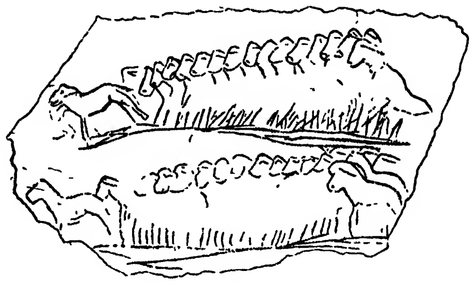

Fig. 315.—Two troops of horses, each with its leader, engraved on a slab of stone, from Le Chaffaud (Vienne). (After Cartailhac, *L'Anthr.*)

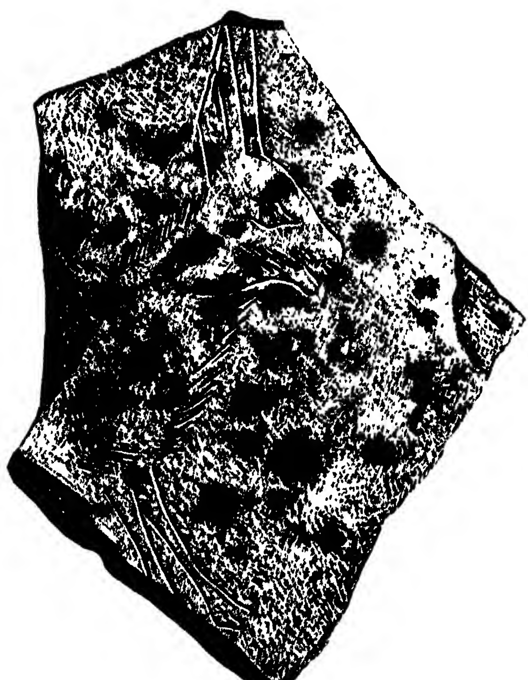

Fig. 316.—Hare engraved on stone from the *Caverne d'Isturitz*. (After Passemard.)

horses in one of the troops of the figures, and nineteen in the other. Przevalsky's wild horse has been observed

in troops of from five to fifteen (all mares), each led by a single stallion.

The sculptures in bone and ivory afford some of the

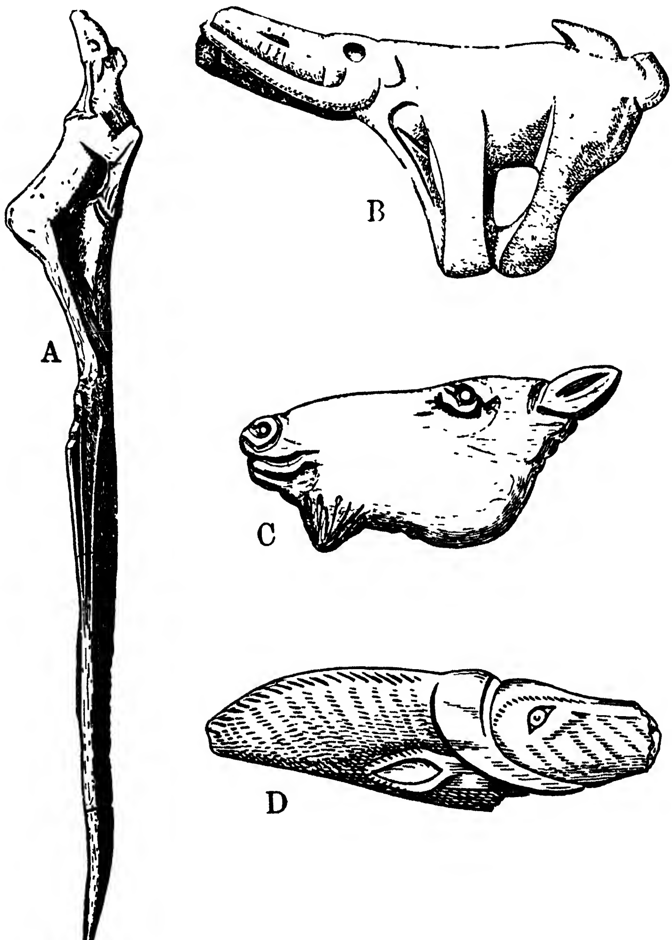

FIG. 317.—A, So-called dagger of reindeer horn, from Laugerie Basse. (From *Reliq. Aquit.* × about $\frac{1}{3}$.) The pose of the carved reindeer suggests an artistic adaptation for use as a dagger-handle. B, Mammoth carved out of reindeer's horn, from Bruniquel. (After A. de Mortillet. × $\frac{1}{2}$.) C, Horse's head in bone, from Saint Marcel. (After Breuil, *L'Anthr.* About original size.) D, Head of musk-ox in deer horn, from the Kesslerloch. (After Merck. Original size.)

finest examples of Magdalenian art; the bone dagger from Laugerie Basse, with its life-like rendering of the reindeer, artistically adapted to form the handle, is a famous example (Fig. 317 A). The same cave has furnished several other daggers; one has the figure of a mammoth for the hilt (Fig. 317 B), another that of some great carnivore. Some of the sculptured figures which have been regarded as the handles of daggers are possibly not of this nature; the Abbé Breuil believes that a few, such as the horse's head (Fig. 317 C) and the head of the musk-ox [1] (Fig. 317 D) may have been magical images merely, while others are the ends of spear-throwers; thus in the case of the mammoth of Fig. 317 B, the pointed process above the rump is the "tooth" of the implement; the elongated trunk, now broken off, provided the shaft. Most of the sculpture, however, is decorative; as additional instances we may cite a pendant carved with the figure of a Saiga antelope, and the ibex which is sculptured in so masterly a manner on the spear-thrower mentioned on p. 526 (Fig. 289). The adossed heads of bison at the extremity of an arrow-straightener may also be recalled here.

The objects shown in Fig. 318 present special points of interest. The drawings in the two upper figures (Fig. 318, 1, 2) occur on opposite sides of a bone pendant, and this association is in itself extremely suggestive. The first drawing represents an animal running at a gallop, and the second, if—as we have a right to assume—related to it, some kind of vehicle, which can be no other than a sledge. That this is its true nature has

[1] Too much stress should not be laid on the curvature of the horns in identifying heads like this with the musk-ox. M. Cartailhac has shown that the horn of the sculptured head from the Grotte d'Arudy (Basses Pyrénées) owes its forward curvature to the exigencies of space. The animal in that case is really a wild goat. E. Cartailhac, *Mat. pour l'histoire de l'homme*, 1888, xxii, p. 292, figs.

already been suggested by Sir Arthur Evans,[1] and a careful examination will, I think, leave but little room for doubt on this point. The animal is not a dog, but some kind of deer, and on comparing it with actual galloping reindeer as represented by Kennan,[2] the resemblance is found to be so close that it is difficult to detect any difference; the sketches might almost be superposed Euclid fashion. But in this same sketch of Kennan's the reindeer are shown drawing a sledge, which in its essential characters agrees with the supposed sledge of our illustration; the two longitudinal pieces (Fig. 318, 2), rising upwards as they extend forwards, correspond with the runners, and the transverse curved bars with bent wooden rods arched upwards, which form the seat of the modern sledge.

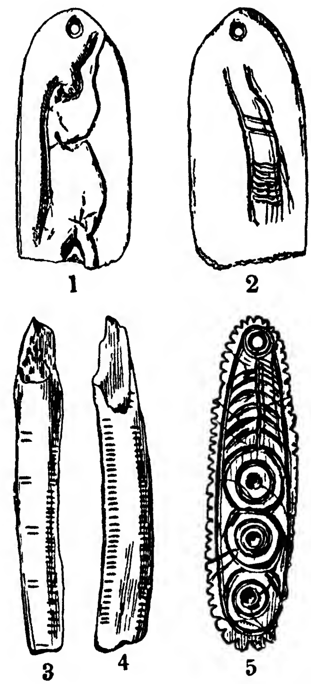

FIG. 318.—Various Magdalenian relics, except 3, 4, which is Aurignacian. 1, 2, a bone pendant, on one side, (1) a reindeer galloping, on the other (2) a sledge, from Saint Marcel, Indre (after Breuil, × 3/4); 3, 4, a bone scored with tally (?) markings, from La Grotte du Pape, Brassempouy (after Piette, × 1/2); 5, a churinga (?) or bull-roarer, in bone, from Saint Marcel, Indre (after Breuil, × 3/4).

During a recent visit to the Museum at Bergen, Norway, I observed a rude sledge from

[1] Cited by Breuil, *L'Anthr.*, 1902, xiii, p. 152.

[2] George Kennan, *Tent-life in Siberia*, New York and London, 1910, plate entitled "A race of wandering Korak reindeer teams," facing p. 212. The same author makes the extremely interesting observation that the bones of the reindeer are soaked in seal oil and burned for fuel (p. 185).

King William Land which in some respects recalls the Magdalenian drawing (Fig. 319). It is made of driftwood, with unhewn cross-ties which make it look like a large clumsy ladder. Piette has figured some other Magdalenian ladder-like forms and interpreted them as signs used in primitive writing; they may very well have been intended for sledges.

There are differences in detail in the representations of the two sledges, Magdalenian and modern, but not more than can be accounted for by differences in the environment. We may therefore conclude with good

Fig. 319.—An Eskimo sledge preserved in the Bergen Museum, Norway. (From a photograph kindly provided by Prof. Brøgger.)

reason that the Magdalenians had already invented the sledge, and learnt to harness the reindeer.

If so, we may be tempted to suppose that there may be some truth in Piette's suggestion that this ingenious people had already succeeded in bridling the horse, and certainly the engraved outlines of horses' heads on which Piette depended for evidence lend themselves at first sight to this interpretation. But the comparative studies of MM. Cartailhac and Breuil have led to another explanation which shows how dangerous it is to trust to first impressions.

A tendency to a conventional representation of animal forms makes itself strongly felt towards the close of the Magdalenian, and it can be clearly traced in the case of the horse's head, as will be seen on examining closely

the series in Fig. 320. In the first drawing (*a*) the hair of the lower jaw strongly emphasised and sharply separated from the rest of the head, is seen below a band with a zigzag line, B B, in the middle, which represents the teeth. In the next (*b*) the generalisation has proceeded a step further and the hair is represented by a band with oblique striations; while in the third (*c*), Piette's most convincing example, the lines defining the muzzle and other features have been so strongly emphasised that they may easily be mistaken for cords

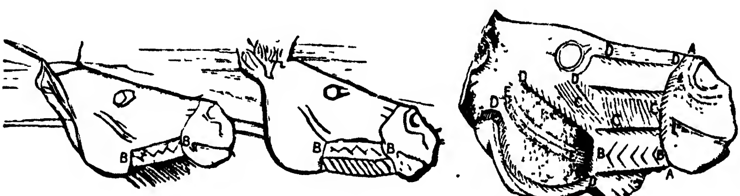

FIG. 320.—Conventional sculpture of the horse's head; *a*, *b*, from Mas d'Azil; *c*, from St. Michel d'Arudy. (After Piette.)

and the sides of the head for rigid bars, the whole arrangement suggesting a halter. That such an interpretation cannot be maintained is clearly shown by the numerous intermediate terms by which MM. Cartailhac and Breuil have succeeded in linking the form *b* with *c*, which thus appears to be simply a case of conventional representation.

The hollow bone scored with transverse markings (Fig. 318, 3, 4) [1] appears to be a kind of tally. It recalls some of the Australian message sticks, and still more the notched sticks of the North American Indians which are used as chronological records or reminders. Russell found among the Pima Indians five of such calendar

[1] This particular example is Aurignacian, but scored bones which may be tally sticks occur in the Magdalenian.

sticks; two of them which were explained by their possessors covered a period of thirty years. The Santu Sioux showed Clark a notched stick, which, they assured him, covered the history of the tribe for 1,000 years.[1] The marks on the left of Fig. 318, 3, look as if they were intended to indicate tens, and on counting the lines on the right hand side these will be found to amount to forty in all, or four tens corresponding with the four divisions on the left; at the same time it must be admitted that the correspondence is not exact in detail, nine, ten, or eleven smaller lines occupying the spaces of the larger divisions.

The last object (Fig. 318, 5) has been doubtfully interpreted as a bull-roarer,[2] an instrument of magic[3] (p. 295) still widely disseminated among primitive races, including the Australians, Bushmen, and the Eskimo.

The engravings and carved figures, no less than the paintings in the caves, illustrate in a remarkable manner the natural history of the Magdalenian age; and their evidence is in complete harmony with that derived from a study of the associated bones. The fauna includes among others the following: reindeer, stag (*Cervus elaphus*), the great Irish deer (*Cervus megaceros*), bison, horse, ass, musk-ox (now confined to Arctic North America), Saiga antelope (now confined to the steppes of Russia), glutton (now distributed over lands bordering the Arctic Ocean), arctic hare (Alpine and Arctic regions); piping hare (*Lagomys pusillus*, an inhabitant of the Asiatic steppes), lemming (restricted to the northern parts of Europe). It is a colder fauna than the Aurignacian; the horse has diminished in numbers;

[1] F. Russell, "The Pima Indians," *Rep. Bur. Ethn.*, 1908, vol. xxvi, p. 34 *et seq.*

[2] A. B. Cook, "Les galets peints du Mas d'Azil," *L'Anthr.*, 1903, xiv, p. 655.

[3] A. C. Haddon, *The Study of Man*, London, 1898, p. 277.

the reindeer increased, so much so indeed that this concluding phase of the Upper Palæolithic well deserves the name of the "reindeer age." The species of the tundra which disappeared, or almost disappeared, during the steppe climate of the Aurignacian have returned. Europe is again subjected to the rigours of a sub-Arctic climate. This recurrence of cold conditions corresponds in all probability to the second great advance of the ice in the last Glacial episode.

These conditions were far, however, from persisting

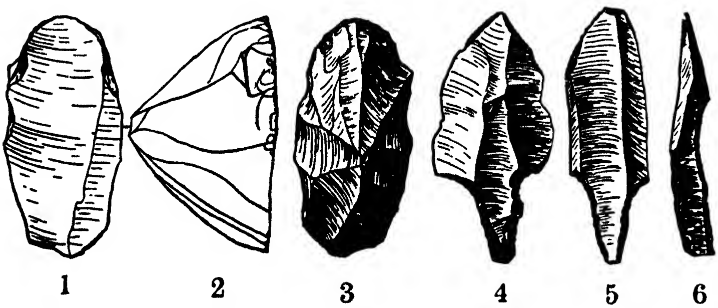

Fig. 321.—1, 2, 3, different aspects of a keeled grattoir, Laugerie Basse; 4, 5, pedunculated points, grotte de la Mairie à Teyjat; 6, atypical, point-à-cran, La Madeleine. All from the end of the Magdalenian. (After Breuil. × $\frac{8}{20}$.)

throughout the whole of the period; at some stage a gradual amelioration of climate set in and made itself especially felt towards the close. Connected with this, no doubt, is the remarkable reappearance of flint implements belonging to Aurignacian types which distinguished the very last days of the Magdalenian age, when we meet again not only with the characteristic keeled grattoir and pedunculate point (Fig. 321) but also with forms recalling the points of the abri Audi and la Gravette (Fig. 322), as well as lateral burins of Upper Aurignacian type. This significant fact has been

justly emphasised by the Abbé Breuil. It looks as though the workers in the Aurignacian industry, which had continued to exist in the Capsian region all through the Magdalenian age, were beginning to move northwards in response, perhaps, to some favourable change in the environment.

At an early period in the study of Palæolithic remains observers were led by the presence of the cold-loving species of the tundra to look to the Arctic regions for the surviving representatives of reindeer men. Pruner Bey was one of the first to identify the Magdalenians with the Mongolians, though on somewhat insufficient grounds. He was followed by Hamy,[1] who asserted that it is solely among Arctic people, Lapps, Eskimos and Chukchis, that we find the same customs, weapons, and implements as those of the Magdalenian age. These races, he remarks, continue down to our own days, in the circumpolar regions, the age of the reindeer as it existed in France, Belgium, and Switzerland.

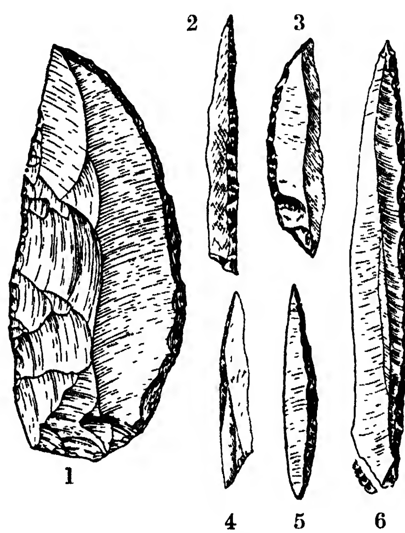

Fig. 322.—1, Point like that of l'abri Audi from the uppermost Magdalenian; 2, Gravette-like point from the Upper Magdalenian; 3 to 6, Gravette-like points from the Proto-Azilian of Sordes. (After Breuil. × about $\frac{2}{3}$.)

A similar view was subsequently expressed by

[1] E. T. Hamy, *Précis de Paléontologie Humaine*, Paris, 1870, p. 366.

Dupont,[1] who pointed to the Eskimo as the one race which makes so close an approach to the Magdalenian in the character of its art, implements, and mode of life, that we may fairly say the age of the reindeer still continues in the Arctic regions. A little later the same opinion found an ardent supporter in Prof. Boyd Dawkins,[2] who suggested that the Magdalenian had followed the reindeer as these had followed the melting ice sheets in their retreat to the north.[3] This is a conclusion, however, which has been strongly contested, especially of late years. Laloy remarks: "Cette théorie est absolument contredite par les faits"[4]; Steensby, the latest writer on the origin of the Eskimo, dismisses it as fantastic and impossible,[5] while M. Joseph Déchelette[6] in his valuable manual rejects all notion of any racial connexion between Magdalenian man and the Eskimo: "C'est en vain qu'on a noté certains traits d'analogie de l'art et de l'industrie . . . telles analogies s'expliquent aisément par la parité des conditions de la vie matérielle."

For my own part, I hardly think the facts can be so simply explained. To take but a single instance. We have already seen how three races remote from one another in space (North American Indians, Bushmen, and Australians) all possess the same curious custom of mutilating the fingers. It is scarcely likely that so

[1] M. E. Dupont, *L'Homme pendant les âges de la pierre*, Brussels, 1872, p. 211.

[2] W. Boyd Dawkins, *Cave Hunting*, London, 1874, p. 353 *et seq.*

[3] A connexion between the Magdalenian and the Eskimo does not necessarily involve this theory, which, though attractive, does not seem to be supported by facts.

[4] Laloy, *L'Anthr.*, 1898, ix, p. 586. This author is mistaken in asserting that in Greenland decoration is confined to lines and points.

[5] H. P. Steensby, *Om Eskimokulturens Oprindelse*, Copenhagen, 1905, pp. 1–219. This work contains a very full bibliography.

[6] J. Déchelette, *Manuel d'Archéologie Préhistorique*, etc., Paris, 1908, p. 312.

strange a proceeding was evolved in response to the environment. The motives alleged are various, but probably the idea of sacrifice is the most fundamental. It would be not a little remarkable, however, if this idea found independent expression in the same extraordinary fashion in three several instances. I cannot help thinking that it is far more likely we have here a case of borrowing from a common source; and we have seen that the custom once prevailed in Southern France, where, as we allege, the ancestors or ancestral relatives of these races were at one time to be found. The view which M. Déchelette sustains entirely ignores the evidence derived from skeletal remains. In face of such conflicting judgements it becomes necessary to examine this question in some detail. If we can find an existing race which may fairly be regarded as the lineal descendants of the Magdalenians, we shall have connected two dissevered ends in human history, thus linking together by a single explanation the fate of one race and the origin of another; but the very consciousness of our desire for continuity must warn us against too facile an acceptance of testimony.

CHAPTER XII

THE ESKIMO

As a useful preliminary to our inquiry we may begin with a brief sketch of the habits and mode of life of the inhabitants of the North American tundra. The belt of barren land which is known as the tundra borders the Arctic Ocean both in the Old World and the New: it supports a scanty vegetation of mosses and lichens, together with a few trees, such as the arctic willow, dwarf birch, and two species of conifers, which are chiefly found in the neighbourhood of lakes and water-courses.[1] Towards the interior the tundra is succeeded by a forest zone characterised by pines and other conifers, but including patches of willow, poplar, and birch. Beyond the forest follows the great prairie or steppe. The men who inhabit these regions are the Red Indians [2] and the Eskimo,[3] both alike members of the Leiotrichi,

[1] "The tundra is by no means so barren as is generally supposed. It is extremely various, in some places desert, in others prairie, abounding in sedges and grasses and rich in flowering plants. Even on the west coast of Greenland, where the vegetation is sparse compared with that of the Canadian arctic archipelago, over 120 different species of flowering plants have been recorded from in or about lat. 76° N." (Communication by letter from Vilhjalmur Stefansson.)

[2] A pedantic objection has been raised to the use of this name on the ground that it is applied to a people who are neither Indians nor red: "red," however, is a term with a very wide meaning, and there is a good historic reason for "Indian"; the nomenclature is consecrated by usage, and cannot lead to any serious misconception. At the same time it may be well to bear in mind, as Dr. Deniker reminds us, that the Indian is only red when painted.

[3] As in the case of many a Scottish clan, the Eskimo owe their name to their enemies, in their case the adjacent Indians: it means "eaters of raw flesh," though as a matter of fact the Eskimo generally cook their

the great group of straight-haired men. The Eskimo occupy the Arctic coast from Greenland to Alaska, and even beyond, extending into the Aleutian Islands and the extreme north-east of Asia, as far as Kolyuchin Bay [1] (Fig. 323). They number, all told, according to Kurl Hassert's estimate made in 1891, about 40,000 individuals.[2] The Chukchi and Kamchadals, characterised by similar habits and mode of life, but belonging to

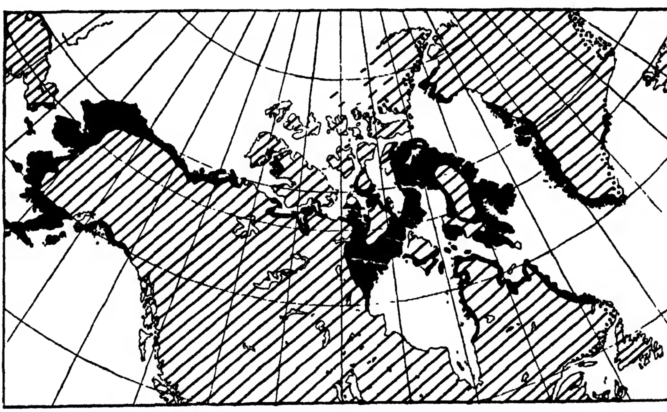

FIG. 323.—Distribution, past and present, of the Eskimos. Past distribution shown by dots, present by black wash. (After Steensby.)

a different race, are found in Kamtchatka and the north-east extremity of Siberia.

Wherever they occur the Eskimo are distinguished by a remarkable uniformity in bodily characters, habits, implements, language, and mode of life. Yet they have no national unity, and completely realise the anarchic

food, unless prevented by necessity. Their own name for themselves is Innuit—*i.e.* men. Mr. Stefansson remarks that the Eskimos have no name for the race as a whole, but only for its various geographical divisions; these are compounded of the root of Innuit and an affix; thus for the Mackenzie district it is Innu-vialuk, for N.W. Alaska Innu-piak, just as we say Welshman or Irishman.

[1] W. H. Dall, *Journ. R. Georgr. Soc.*, iii, p. 568, 1881.

[2] "I think the best guess at the Eskimo population to-day is 25,000." Hassert's estimate was probably correct in 1891. (Note by V. Stefansson.)

ideal of government; they are without chiefs, and even the "angakok" or medicine-man possesses far less authority or influence than his nearest homologue, the Asiatic shaman. The only differentiation of labour is that between men's work and women's work.

Some fifty dialects have been distinguished in their language, but the most unlike of these, *i.e.* the dialect spoken on the east coast of Greenland and that on the Asiatic side of Bering Strait, do not differ more than, say, English and German. Thalbitzer,[1] the latest writer on the subject, remarks that the Eskimo language, so far as it is known, stands apart from all others. No one has yet succeeded in discovering any language, either in Asia or among the American Indians, which might possibly have been originally related to it.

Their physical characters bear the same testimony, and stamp them as a race apart; their resemblance to the Mongolians, though marked in many respects, is no greater than might be expected to exist between two races which are both included within the Leiotrichi.

The Eskimo (Fig. 324) are of short stature, the mean height of the Greenlanders being 1621 mm.[2] Their hair is absolutely black, coarse, and straight like a horse's mane. Their skin is reddish-brown in colour[3]; smooth and full to the touch, like a negro's. Their eyes are dark brown; the orbit is wide and high. The face is

[1] W. Thalbitzer, "A Phonetic Study of the Eskimo Language," *Meddelelser om Grønland*, Hefte 31, Copenhagen, 1904.

[2] This is true of the Greenlanders, but towards the west the height increases; men of six feet are sometimes met with at the mouth of the Mackenzie river, and still more often in N.W. Alaska."—V. Stefansson.

[3] "Eskimos vary as much in complexion as the people of the British Isles . . . they tan more readily than Europeans. A woman who has been in the house all the winter may be nearly as fair-skinned in March as a North European, but as dark as the average Sicilian by the end of April." (Note by V. Stefansson.)

FIG. 324.—Portraits of Polar Eskimo. 1. A man named Uvdloriark, about 35 years of age, dressed in tunic, trousers, and boots, but without gloves. 2. A man named Masaitsiac, about 55 years old, a great "angakok." 3. A woman, Kiajuk, about 50 years old, full face. 4. The same in profile. The Polar Eskimo inhabit North-West Greenland; they are the most northern people on the globe. (After Steensby.)

long and orthognathous; the nose both long and narrow: it is indeed the most leptorhine as yet observed. The head is long,[1] high, and wall-sided, with a pent-roof-like summit. The cranial capacity is great, according to Duckworth, 1550 c.c., thus surpassing some of the most civilised peoples of Europe.[2]

The Indians, who succeed the Eskimo towards the interior, occupy a broad belt of wood and tundra stretching right across the continent; they are divided into two great races—the Algonkian on the east and the Athapascan on the west. In mode of life there is a considerable amount of resemblance between the Eskimo and these northern Indians; and some of the Algonkians possess very similar bodily characters, except as regards stature, the Algonkians being a tall people. They are also less dolichocephalic, though towards the east they make a close approach to the Eskimo in this respect.[3]

[1] "There is a steady change towards brachycephaly as we go west along the northern coast of America: probably due to intermixture with the Athabascans." (Note by V. Stefansson.)

[2] Brierly, however, from an examination of seventeen skulls found in Greenland, obtained an average of only 1357 c.c. J. Brierly, *Journ. Anthr. Inst.*, 1906, xxxvi, p. 120. For an account of the brain, see Chudzinski, "Trois encéphales des Esquimaux," *Bull. Soc. d'Anthr.*, Paris, 1881, ser. 3, vol. iv, p. 312, and A. Hrdlicka, "An Eskimo Brain," *Am. Anthr.*, 1901, p. 454.

[3] The taxonomic position of the American races may be indicated by the following attempt at classification. The Leiotrichi include two groups, one characterised by finer and the other by coarser hair (Deniker, "Essai d'une Classification des Races Humaines," *Bull. Soc. d'Anthr.*, 1889). We will distinguish them as the Leptocomæ and the Pachycomæ. The Pachycomæ may be subdivided into the Mongoloids, with a small and depressed nose, and the Americans or Amerinds, with a large and salient nose. The Amerinds then fall into the following groups:

Dolichocephalic; long face; short stature .	Eskimo.
Mesaticephalic; ,, ,, .	Fuegian, Botocado.
Brachycephalic; nose aquiline; tall or medium height	Redskins (the Eastern Algonkians are dolichocephalic).
Brachycephalic; nose straight or upturned { tall . .	Patagonian.
{ short . .	South American Indians.

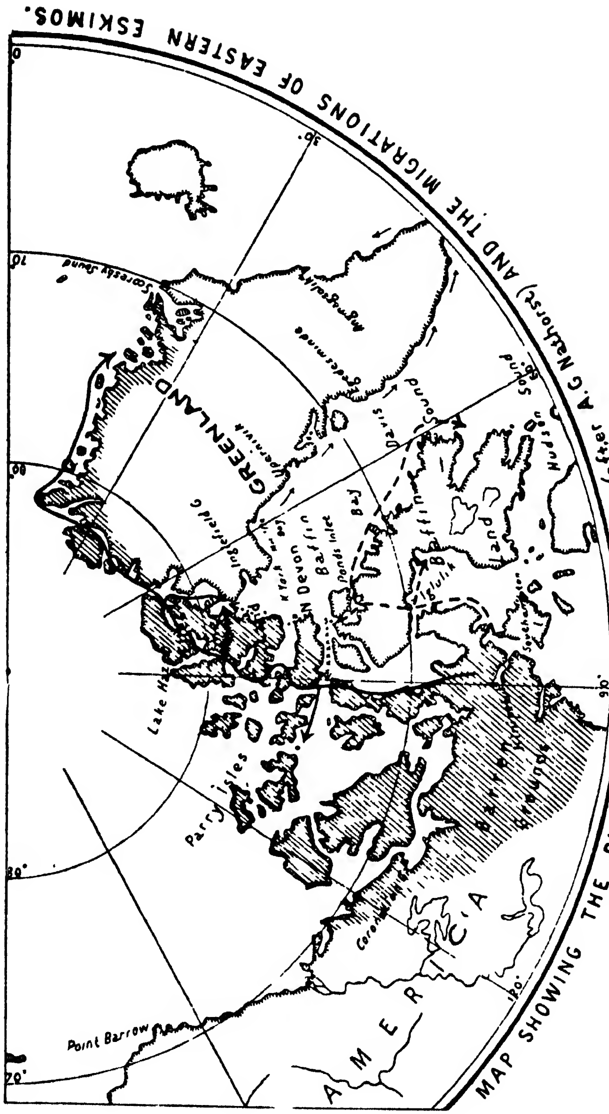

FIG. 325.—(After Steensby.)

The other animals which inhabit the tundra and the pine woods are the fox, wolf, bear, and marten; squirrels, hare, beaver, and beaver-rat; the musk

ox (Fig. 103), which is restricted to the tundra, and never enters the woods (Fig. 325); the mountain sheep, which is found in the Rocky Mountains, the elk or moose and the caribou [1] (reindeer). There are also abundant water-fowl, and the waters swarm with fish, especially salmon, sturgeon, pike, and the white fish (*Coregonus albus*). The last-named, much esteemed for its fine flavour, contributes largely to the sustenance of the Indians during the winter; it is the chief food of the Ojibways (Algonkian), who call it the "reindeer of the water."

The passage of the sun across the equator sets a great part of this animal world in motion. The reindeer, on which the very existence of man depends in these inhospitable regions of the north, leaves the forest belt at about the end of May and travels northward over the tundra in search of fresh vegetation.[2] It marches in herds numbering many thousands of individuals, reaches the margin of the Arctic Ocean just before the winter ice breaks up, and finds a passage over this to the islands lying off the coast, which furnish its most northerly feeding-grounds. There, isolated from the continent after the disappearance of the ice by the open sea, it enjoys the short Arctic summer, and fares well,

[1] In America the term caribou is restricted to the wild reindeer; only the domesticated animals are called reindeer.

[2] This statement requires qualification. Caribou (reindeer), Stefansson remarks, move about a good deal, but do not migrate in the sense that geese do. In the north they are sometimes more numerous during winter than summer. The general rule seems to be that caribou become restless and tend to move out of any country when the food supply for any reason becomes poor. Generally speaking, when they do move, they travel against the prevailing wind, probably because this ensures, through their sense of smell, a ready warning of danger ahead; it also prevents their eyes being filled with snow by the eddies of a blizzard if one be blowing.

They do not appear to feel cold or to show any inclination to seek shelter. At $-50°$ F., and with a moderate wind blowing, they lie contentedly on the tops of small knolls as cows do in a sunny pasture in England. (Note by V. Stefansson.)

growing sleek and fat, till on the approach of winter it turns south again, crosses the sea as soon as the surface is covered with fresh ice, and regains its home in the woods. In these annual oscillatory migrations it is exposed to continual danger: wolves are never very far off; from the woods through the tundra the Indian follows the herds as far as the limits set by the Eskimo occupation, or if farther at his own peril; beyond this limit the hunt is continued by the Eskimo himself. There is no close time for the reindeer,[1] but it is more particularly during the return journey, when the animal is in good condition, and accompanied by its newly-foaled young, that its flesh is sought. In the case of the reindeer both Eskimo and Indian pursue the same methods of capture: it is waylaid at spots where its trail crosses a river, or it is driven by noise and alarms in the direction of convergent stone fences, which extend for great distances, and lead to a lake or water-course, where the hunter waits concealed in his birch-bark canoe or his kayak, ready to dispatch victim after victim with his spear. By this latter method, when the plot is well arranged and the herd not too large, not a single animal will escape. The reindeer flesh is the favourite meat of Indian and Eskimo alike: every part of the animal is eaten, even the contents of the stomach; the blood is boiled, and makes a rich brown soup, greatly esteemed as a dainty; sometimes the half-digested vegetable food from the stomach is mixed with the blood before boiling—a welcome addition in a region where plants edible by man are scarce or altogether absent.[2] The marrow is extracted from the bones,

[1] The Eskimo taboos ensured a close season very effectively, but they are breaking down, and in a short time probably the statement in the text will be correct. (Note by V. Stefansson.)

[2] It would seem reasonable to semi-vegetarians like ourselves that

which are then pounded small and the fat boiled out.

The autumn hunting affords a rich store of reindeer meat, which is dried and set aside as provision for the winter. The mode of curing, at least among the Indians, is as follows:—The flesh is first cut in thin slices and dried in the sun, or over the smoke of a slow fire. It is then pounded between stones, and finally a quantity of melted fat—about one-third of its bulk—is poured over it. The result is the well-known pemmican. If carefully protected from damp it will keep good for several years. The horns of the animal are used to make fishing-spears and fish-hooks, ice-chisels, and other implements. The skin is carefully dressed, cut into shape, and made up into winter clothing. A shin-bone, split longitudinally, is used as a scraper to remove superfluous hair and fat. The undressed hide furnishes a substitute for rope. It is cut into long strips of various thicknesses and twisted into thongs for deer-snares, bow-strings, net-lines, fishing-nets, and snow-shoes. The tendon of the dorsal muscle is split up into

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vegetables would be a welcome addition to the diet of a meat-eating people, but experience shows that this is not the case. In Western Alaska, where food runs short now and then, vegetables are freely eaten, but not to the extent that prevails among us: they are preserved for winter use and are preferred in that state. But as we proceed to the east along the north coast of Alaska, animal food becomes increasingly abundant and the supply more constant: concomitantly vegetables enter more sparingly into the diet, until on reaching Coronation Gulf their contribution is negligible. The cloudberry [a dwarf raspberry], for instance, which is considered delicious by white men and the Eskimos of Western Alaska, grows in great abundance south of Coronation Gulf, but the Eskimos of that region never ate it and had never heard of its being eaten, nor could we persuade them to make it a part of their diet. A few small children took to eating the berries but none of the adults.

On the American coast the contents of the caribou stomachs are sometimes eaten, but very rarely. The habit is about as common as the eating of Limburger cheese in England. (Note by V. Stefansson.)

The Labrador Eskimos, however, make considerable use of many of the berries in which their country abounds.—E. W. Hawkes, *The Labrador Eskimo; Geological Survey*, Memoir 91. Ottawa, 1916, p. 35.

fine threads for sewing. During the absence of the reindeer—*i.e.* for about eight or nine months of the year—the Indians of the tundra live chiefly on white fish, which is caught by hook or net: in winter, when all the lakes and waterways are thickly frozen over, the nets or hooks are introduced through holes broken in the ice.

The Eskimo hunter, while possessing much in common with the Indian, is distinguished by greater aptitude and by special methods of his own. He represents the triumph of human adaptation to the changing conditions of a rigorous climate; by the variety and ingenuity of his implements, weapons, and devices he has brought the art of hunting to its very highest state of differentiation, and in the exercise of this art he stands supreme among all the hunting races of the world.

In summer (July to September), when the sea is open, he lives in tents made of reindeer skin or seal's skin, and hunts the seal with harpoon and bladder from his kayak, using a spear-thrower to hurl the harpoon. In some localities, as at Point Barrow, he also goes a-whaling at this season. The whales migrate towards the north at the beginning of summer, and return about the end of August, moving southwards to the Mackenzie: on the return journey they are attacked from umiaks (large skin-covered boats), containing as many as twelve men, all armed with harpoons. When a whale appears, as many harpoons as possible are cast into it, and endeavours are made to drive it towards the shallow water off the shore. The whale is valued, not only for its flesh and blubber, but also for a variety of useful material; threads of "whalebone" are used for making nets, its jaws serve as runners for sledges, and when wood is scarce its ribs are used for rafters or tent poles.

Fishing is also carried on in the inland waters, chiefly by children, women, and old men: the fish are taken by hooks, nets, and barbed spears or harpoons. In dangerous places, such as rapids or whirlpools, the sport requires great skill and nerve, and is undertaken by able-bodied hunters. Birds are shot with a fowling spear, or captured by a kind of miniature bolas: their eggs are collected by the children.

In autumn (August and September), when the reindeer are on the homeward road, the best hunting of the year begins, and a heavy tax is levied on these animals, to provide not only for present eating, but also a sufficient store for the winter season. Salmon fishing is also actively pursued, and large quantities of these fish are preserved for future use.

At the beginning of winter (October) the Eskimo go into their winter house, a solidly constructed dwelling capable of containing several families. It is sometimes built of stones, sometimes of timber, and in each case thickly covered over with a layer of earth. The wooden house is ingeniously designed, with a skeleton of upright pillars and transverse balks, to which the boards forming the walls and roof are affixed. The timber is furnished by driftwood found on the coast: in some localities this driftwood is so scarce that it may take three or even five years to collect as much as will build a single house or provide the framework of a boat. It is said that these winter houses are the best that could be devised, under the circumstances, to meet the rigours of an Arctic climate. They are entered by a long covered passage, and warmed by blubber lamps: these (Fig. 326) are simple variously shaped bowls of soapstone, sandstone, or other rock, in which blubber, usually obtained from the seal, is burnt. The houses are so

proof against cold that, with these lamps, a temperature of 20° C. is maintained. Speaking of the Greenland houses, which are built of stone, Hans Egede remarks: "I cannot forbear taking Notice, that though in one of these Houses there be ten or twenty Train-Lamps, one does not perceive the Steam or Smoak thereof to fill these small Cottages: The Reason, I imagine, is the Care they take in trimming those Lamps—viz. they take dry Moss, rubbed very small, which they lay on one Side of the Lamp, which, being lighted, burns softly, and does not cause any Smoak, if they do not lay it on too thick, or in Lumps. This Fire gives such a Heat,

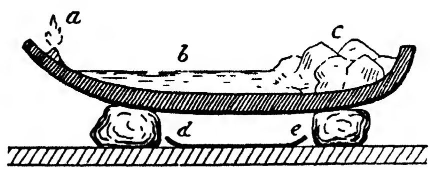

Fig. 326.—Eskimo lamp. *a*, flame from the moss; *b*, melted blubber; *c*, lumps of blubber; *d*, *e*, dish to catch drippings from the fat. (After Steensby.)

that it not only serves to boil their Victuals, but also heats their Rooms to that Degree, that it is as hot as a Bagnio. But for those who are not used to this Way of firing, the Smell is very disagreeable, as well by the Number of Burning Lamps, all fed with Train-Oil, as on account of divers Sorts of raw Meat, Fishes and Fat, which they heap up in their Habitations; but especially their Urine-Tubs smell most insufferably, and strikes one, that is not accustomed to it, to the very Heart."[1]

On entering into winter quarters the Eskimo begins to reward himself for the labours of the year: reindeer meat, seal's blubber, and dried salmon furnish forth a long succession of Gargantuan feasts, which continue as

[1] Hans Egede, *A Description of Greenland*, London, 1745, p. 117.

long as the provisions last. When they give out—and in good times this will not be till the darkest days are past—hunting must perforce begin again. By this time the ground has long been frozen hard; rivers, lakes, and the sea are covered with a continuous sheet of smooth winter ice. Hares may now be trapped; the musk-ox, which never leaves the tundra, is an easy prey, but never eaten, except as a last resort [1]; the arctic bear may be engaged in fight, and this calls for all the skill and courage shared by the two men who undertake the combat. But the main food of many Eskimo tribes, both now and all through the greater part of the year, is provided by the seal. There are four kinds of seal in the Arctic Ocean, and two of them extend northwards beyond the Arctic Circle, as far as Grinnell Land. One or other species is fairly plentiful up to lat. 60° N.; its favourite haunts are deep fjords, covered for nine months of the year with smooth ice. It makes holes in the ice in order to obtain air to breathe, and in summer it crawls up through larger holes on to the ice to bask in the sun. In spring it feeds its young in a hole under the snow, and when the snow has melted away it returns to the ice. The walrus, which affords a favourite food, is far less widely distributed. It is most dainty in its choice of a dwelling-place; the sea must not be too deep, the bottom must be covered with abundant shell-fish, and certain relations must exist between the sea-currents and the ice.

In late winter and spring, the Eskimos, for the most

[1] This is a current mistake, as I am informed by Dr. Stefansson, who writes: "I do not believe there is any district inhabited by musk oxen where the Eskimos are not exceedingly fond of the meat. It is not quite correct, however, to speak of a district inhabited both by Eskimos and musk oxen, for in strict fact that can never occur. Musk oxen are animals that do not flee their enemies and consequently are bound to be exterminated when in contact with a hunting people."

part, leave the land and spread in small groups over the ice, travelling by dog-sledges along the coast, and never remaining very long in one place. They live at this time in snow houses, warmed by blubber lamps, and hunt seals, chiefly by the "maupak" method—that is, the hunter sits down by the side of an air-hole and waits till a seal comes up to breathe, when he dispatches it with a harpoon; as the year advances, the "arpok" method is also used, the seal in this case being killed as it lies basking at midday in the sun.

The dress of the Eskimo, which is much the same for the women as the men, consists of short trousers and a tunic ending above in a hood to cover the head (Fig. 324). The trousers are sometimes continued downwards into stocking feet. Of boots, which are well made, they have a great variety, to be worn according to the weather. Shoes with very ingeniously contrived soles are made for walking on the ice. Fur gloves or mittens are also worn. An overall for use in wet weather is made from the intestines of the seal. The intestine is thoroughly cleaned, inflated with air, and hung up to dry. It is then carefully flattened and rolled up tight, like a spool of ribbon. When required for use it is slit up longitudinally, and makes a strip about three to five inches wide. The margin is pared, and several strips are sewn together into the desired form. These overalls are extremely light, not above six or seven ounces in weight. The transparency of the seal's gut renders it useful for other purposes: it makes an excellent substitute for glass as a window-pane.

The Eskimo wear their dress only when out of doors; in the houses they go stark naked, and the first hospitality offered to a visitor is an invitation to strip.

Notwithstanding the hardships of the struggle which

the Eskimo wage with reluctant Nature for their existence, they were at one time by no means a miserable race; they made themselves comfortable in a frozen region where other men would have perished, took a healthy enjoyment in life, and were distinguished by many estimable domestic and social qualities. The intrusion of the white man has brought with it its usual blight—poverty, sickness, selfishness, and loss of self-respect. It would be beyond our province to give instances, but one case where a different result might have been expected may be cited from Rink. He writes :—

"On approaching these places [Ny Herrnhut and Lichtenfels] the visitor, on being told that each of them contains about a hundred natives and two or three missionary families, will be at a loss to make out where the former have their abodes. The mission lodges are pretty spacious, and for Greenland even stately in appearance. The stranger will probably be surprised on being informed that these buildings are only inhabited by missionaries, because he discovers nothing like human dwellings anywhere else. Then his attention will be called to something resembling dunghills scattered over low rocks and partly overgrown with grass, and he will be surprised to learn that the native population live in these dens."[1] At one time these people had good winter houses.

The number of Eskimo is diminishing, especially in Greenland, and if the race should become extinct, the country will remain uninhabited, for white men alone could not live there.

Detailed descriptions of the implements, weapons, and miscellaneous possessions of the Eskimo may be found

[1] H. Rink, *Danish Greenland*, London, 1877, p. 181.

in the Annual Reports of the Bureau of Ethnology, published in Washington and in the Museum Bulletins (Anthropological Series) of the Geological Survey of Canada, published in Ottawa: a brief enumeration will suffice for our purpose. The kayak, umiak, salmon-fork, bird spear, spear-thrower, bow (Fig. 327) and arrow, bird bolas, and skin tent are chiefly used in summer; dog sledges, harpoons (Fig. 328), spears, winter houses and blubber lamps during the winter; besides these there are bow drills, arrow-straighteners, needles

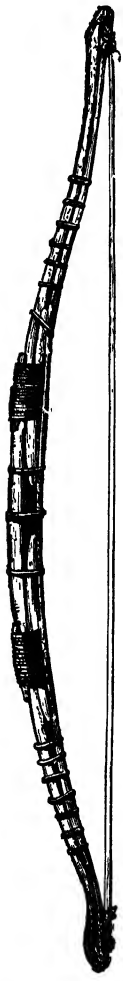

FIG. 327.—The Eskimo bow. (After Ratzel.)

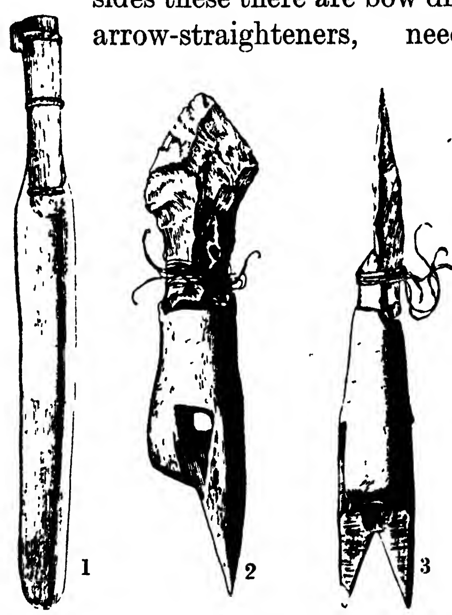

FIG. 328.—1, a snow-scraper. 2 and 3, harpoon head of ivory with a flint point. (After Boas.)

and needle-cases (Fig. 329), bone pins, tool-bags with bone handles, buckles, belt-fasteners, snow-picks, hair combs, and a vast variety of other miscellaneous objects.

The adjacent Indians possess the birch-bark canoe in two forms, a larger corresponding to the Eskimo's umiak, and a smaller corresponding to the kayak, which is sometimes covered in for as much as three-quarters of its length; snow-shoes, sledges for travelling over snow, drawn by women assisted by dogs, the bow and arrow, spear-thrower, ice-chisel, fish-hooks, nets,

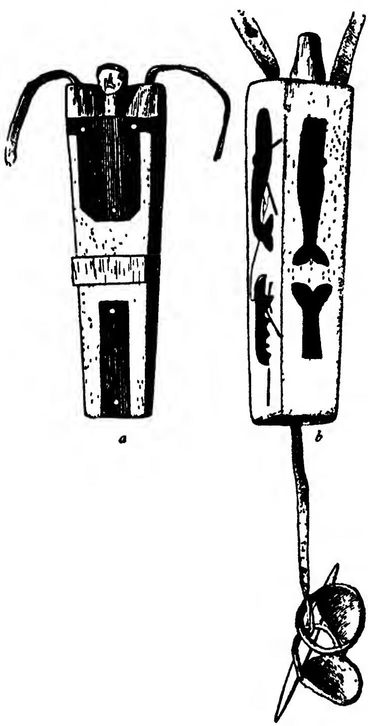

FIG. 329.—Wooden needle-cases.[1] Baffin Land Eskimo. To one of them a pair of thimbles is linked over an ivory bar. (After Boas.)

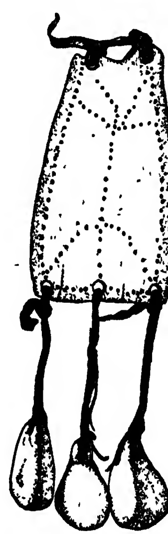

FIG. 330.—An ornament for the hair with pendants of reindeers' teeth. Baffin Land Eskimo. (After Boas.)

and fishing-spears: to ensure their recovery the arrows are sometimes attached by a long thread to the bow, and a line held at one end in the hand is sometimes attached to the fishing-spear. In some cases, indeed, as among

[1] In King William Land the Eskimo use a hollow long bone as a needle-case; a similar needle-case still containing its needles has been found in a Magdalenian deposit.

the Ojibways and Shoshones, a rudimentary harpoon (Fig. 331) was at one time in use, provided with a point which, on entering its victim, became detached from its immediate union with the shaft, a connexion, however, being still secured by a long intervening line. The Eskimo harpoon (Fig. 328) is a further development of the same device: it is distinguished from all others by the introduction of an additional movable segment [1] between the detachable point and the shaft (not shown in the illustration). The intermediate piece is articulated with the shaft by a ball and socket joint, and held in position by two stout thongs of reindeer hide which pass through holes drilled in it and the shaft.

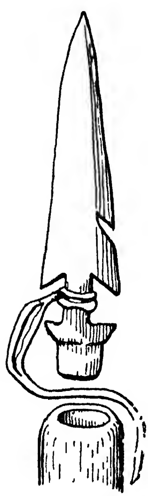

FIG. 331.—A rudimentary harpoon used by the Alaskans. (From *Rel. Aq.*)

The stone implements [2] found in the ancient kitchen middens of Greenland are as a class typically Upper Palæolithic, but not restricted to any particular industry; thus there are grattoirs which have been compared to Acheulean bouchers, Aurignacian spokeshaves and end-scrapers; knives with the Solutrean retouch and long blades which resemble the Magdalenian.

If now we turn to the Magdalenian implements, we must admit that a large number of those most characteristic of the Eskimo are not to be found among them. The sledge (?), the kayak, and the fully developed harpoon are all missing, and since in each of these bone or ivory

[1] This is said to be a comparatively recent device.
[2] O. Solberg, *Vorgeschichte der Osteskimo.*

occurs as an essential part, they should have left some trace of their existence, had the Magdalenians possessed them. This argument does not apply, however, to the birch-bark canoe and wooden sledge of the inhabitants of Eastern Siberia or of the Athapascans and Algonkians of North America, for, as we have seen, wood is a perishable material. There is indeed good reason, as we have already shown, for supposing that the Magdalenians made use of a wooden sledge (Fig. 318, 1, 2).

The sledge, the kayak, and the harpoon of the Eskimo are all highly specialised instruments, and we should scarcely expect to find the remote ancestors of the race in full possession of the completely developed Eskimo culture as it now exists.

When we examine the various kinds of objects which are common to the Eskimo and Magdalenians, we cannot fail to remark a surprising amount of resemblance between them in detail. There is no essential difference between the more primitive Eskimo arrow-straighteners and those of the Magdalenians; the bone arrow-heads are often strikingly similar, and this similarity extends to those used by the Indians, especially as regards the character of the ownership marks; the bone hairpins of the Magdalenians may be matched among those of the Eskimo, and the lobate ivory pendants, sometimes heart-shaped, which both races possess, are almost identical in size and form. These are used by the Eskimo as ornamental appendages to fur bags, "housewives," or clothing. Other little pendants of unknown use among the Eskimo (Fig. 305) resemble the Magdalenian in every respect, and this is a very important fact. It is resemblance in trivial detail which impresses us quite as much, if not more, than resemblance in general design. The snow-scrapers (Fig. 328), if we are correct in our

interpretations of the Magdalenian implement shown in Fig. 301, are similar in both races.

The ivory "lissoir" or smoother of the Eskimo (Fig. 332) is represented in the Magdalenian industry, but it also occurs earlier in Aurignacian deposits.

No great stress can be laid on the bone needles, for these are rather widely distributed, yet it is interesting to observe that needles are unknown among the American Indians, who retain the more ancient fashion of sewing with an awl. The bone pins of the Magdalenians seem to anticipate the taa-poo-tas of the Eskimo. The barbed bone spear-head of the Magdalenian more closely resembles that of the Eskimo than of any other people; that in use among the Fuegians is simpler and ruder in form; but it is by no means certain that the Fuegians should be omitted from this comparison.

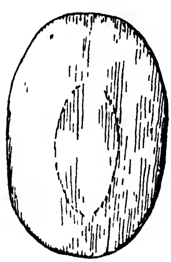

FIG. 332. — An ivory smoother used by the Eskimo of Point Franklin, West Georgia. (Pitt-Rivers Coll., Oxford. × ½.)

The spear-thrower is common to the Magdalenians, Eskimo, Indians, and many other races, including the Australians, and thus does not count for much; nor should we omit to point out that the form of the Magdalenian implement is very different from that of the Eskimo.

The sculpture of figures in the round presents many remarkable analogies, the horse, mammoth, and musk-ox of the Magdalenians finding parallels in the whales, seals, and bears of the Eskimo, though, on the ground of art, superiority must be allowed to the more ancient race. The same is true of the line engravings, with which both adorned their implements. The Magdalenian

sketches are always the more realistic, the Eskimo the more conventional. There is also a difference in motive. The Magdalenian artist was an artist in the truest sense, he took pleasure in the graceful form and attitudes of the reindeer and delighted in representing it; the Eskimo, on the other hand, is more interested in story-telling, his drawings show a strong tendency towards picture writing, and almost achieve it (Fig. 333). The difference will be perceived at a glance on comparing the figure of a feeding reindeer from the Kesslerloch (Fig. 308), with the drawings engraved on an Eskimo arrow-straightener preserved in the British Museum

Fig. 333.—Drawings on Eskimo bow-drills. On the left a woman gathering berries; in the middle, two boys playing football; on the right, hunters quarrelling over possession of game.

(Fig. 291 B). In the one our admiration is aroused by the truthful outline and artistic feeling of the sketch; in the other our pleasure is less æsthetic, but perhaps more intellectual; we are impressed by the skill with which the animals are generalised—the detail is as sparing as in Egyptian hieroglyphs and the symbolisation is just as correct—but our chief interest is in the event which the drawing records. In the one case the object of the drawing is a reindeer, in the other, a reindeer hunt. The hunters, disguised with reindeer horns, are stalking the unsuspecting herd. This difference is essentially similar to that which we have already observed in our study both of Bushman and Palæolithic art, though the Bushmen have retained to a greater degree a love of animal portraiture.

We should perhaps scarcely have expected this order of development, though now that it is suggested good reasons can be found for it.

Children often display a remarkable aptitude for rough portraiture; the illustration (Fig. 334) records the spontaneous efforts of an untaught English girl at the age of seven or eight. They are admitted by their victims to be excellent caricatures, but the artist showed no signs of unusual ability with her pencil in later

Fig. 334.—Photographs of portraits drawn by an untaught girl seven or eight years of age.

years. A stage of imitative art may thus occur in the childhood both of the individual and the race.

On a general review of the facts it would appear that, allowing for the long interval which separates the Magdalenian from the Eskimo in time, there is a sufficient degree of similarity between the products of their industry and art to furnish a *prima-facie* case in favour of an alliance by culture. The evidence is indeed very strong, though not perhaps by itself convincing; and if, proceeding a step further, we begin to speculate on the consanguinity of the two races, we are met with

geographical difficulties, not to mention others, which are amply sufficient to justify those who maintain a sceptical attitude.

There still remains, however, one class of evidence to which as yet we have made no allusion: it is that relating to the bodily characteristics of Magdalenian man. Such of his skeletal remains as are preserved in our museums are still surprisingly few; many more, no doubt, have been encountered by the explorers of caves, but unfortunately many of these persons were more intent on enriching their collections with "curiosities" than on scientific investigation, and we have to deplore, in consequence, the loss of much precious material, which has been ruthlessly destroyed because it was not fitted to adorn a cabinet.

Few even of those remains which have been acquired by scientific investigators have as yet been completely described, and much will have to be done before the racial affinities of most of them are soundly established. So far, we seem to have evidence of the contemporaneous existence of two distinct races, one allied to the "giants" of Mentone, the Crô-Magnon race, which, as we have seen, was already in existence in the Aurignacian age; and the other represented by a man of comparatively low stature, whose skeleton was found at Chancelade.

Skeletons of admittedly Magdalenian age have been found at La Madeleine; Laugerie Basse; des Forges, Bruniquel; Duruthy near Sordes (Landes); and Les Hoteaux (Ain), and it is on the evidence afforded by those obtained from the first three stations that Quatrefages and Hamy [1] assigned them to the Crô-Magnon race.

[1] A. de Quatrefages and E. T. Hamy; *Crania Ethnica*, Paris, 1882, p. 44 *et seq.*, and E. T. Hamy, *Bull. Soc. Anthr.*, 1874, 2nd Ser., ix, p. 652 *et seq.*

The skeleton found at Laugerie Basse[1] (Fig. 335), erroneously termed *l'homme écrasé*, bears witness, as does that of Chancelade, to burial in the contracted posture. Judging from the circumstances of his burial the so-called "l'homme écrasé" was a person of some importance. Several large cowries (*Cypræa pyrum* and *C. lurida*) which must have been obtained from the Mediterranean, probably by barter like that we have described as existing in Australia (p. 278), were disposed about the skeleton, four on the head, and a pair at each elbow, each knee and each foot.[2] They were possibly sewn to the clothing, the corpse being buried fully dressed, and—as shown by the arrangement of the skeleton — with the limbs drawn up and ligatured in the contracted posture. The bones were not well enough preserved for satisfactory measurement. The humerus is not complete, what remains of it is 305 mm. in length, but it is estimated that in its intact state it was 335 mm.; so with the

FIG. 335.—The so-called *l'homme écrasé* from Laugerie Basse, Dordogne, with associated shells. A Crô-Magnon skeleton of Magdalenian age. (After Cartailhac.)

[1] See E. Cartailhac, "Un squelette humain de l'âge du renne à Laugerie-Basse," *Bull. Soc. d'Hist. Nat. Toulouse*, 1872, and V. Giuffrida-Ruggeri, *loc. cit.* Ruggeri regards "l'homme écrasé" as a member of the Mediterranean race.

[2] This reminds us of the great esteem in which an allied shell (Ovulum) is held by the Solomon Islanders, who employ it largely for decorative purposes. It is also a sign among them of high rank.

fibula, from the existing portion, 304 mm. long, it is estimated that when entire it must have been 390 mm., results which are consistent with Crô-Magnon affinities. The skull is also very imperfect, but such features as it displays are regarded by Quatrefages and Hamy as truly Crô-Magnon: Giuffrida-Ruggeri, however, is inclined to assign it to a different race. It is to be hoped that some one of the brilliant anatomists who are now pursuing their inquiries in France will make a renewed investigation of existing data in the light of modern knowledge.

As we have already seen, the Crô-Magnon race was distinguished by tall stature, a short face and depressed orbits, and thus cannot have been Eskimo, nor does it appear to be represented among the North American Athapascans or Algonkians, whether living or fossil.

The Crô-Magnon was the first discovered of the two Magdalenian races, and for a long time afforded the only evidence we possessed of the physical characters of Magdalenian man. Our knowledge of the Chancelade race to which we now pass is based on a single skeleton found on October 10, 1888. It lay buried in the deposits of a rock shelter on the left bank of a rivulet called the Beauronne, 7 kilometres north-west of Perigueux, in the commune of Chancelade. The remains of a rich Pleistocene fauna, flint implements of Magdalenian type, as well as implements of bone and reindeer's horn, were found associated with it. It rested on a rocky floor at a depth of 1·64 metres from the surface of the soil; overlying it were first a hearth and associated débris, 37 cm. thick; then a sterile layer, 32 cm. thick; next another hearth and débris, 40 cm. thick; and finally a superficial layer of cave earth, 53 cm. thick.

We owe a masterly anatomical study of the skeleton

to Dr. Testut, who states that it represents a man of low stature, only 1500 mm. in height, with a large skull (capacity 1700 c.c.) having the characteristic Eskimo form (Fig. 336); a comparison which is borne out by every feature in detail; it is wall-sided, with a pent-like roof, and dolichocephalic, with an index (72·02) scarcely

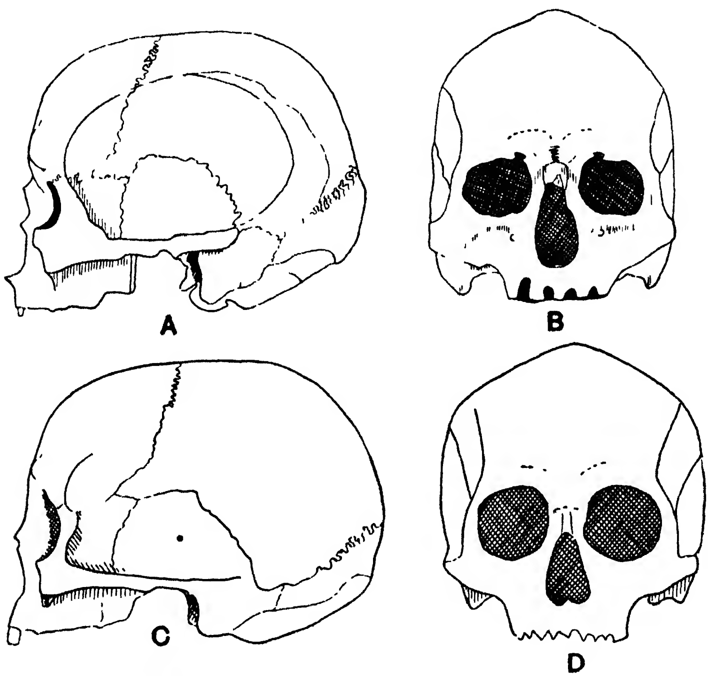

FIG. 336.—The Magdalenian skull of Chancelade (A, B), and a recent Eskimo skull (C, D). (Both × ¼ about. A, B, after Testut; C, D, from a specimen in the University Museum, Oxford.)

differing from that of the Eskimo (mean value 71·72); the face is remarkable for its length, and there is a close correspondence in the relation between the length and the breadth, or the facial index, which amounts to 72·8 in the Chancelade and 72·2 in the Eskimo skull; the nose also is long and narrow, its index (42·5) agreeing

closely with that of the Eskimo (42·62); the orbit is wide and high, just as in the Eskimo, its index being 86·97, and that of the Eskimo 87·8; the palate is fairly long in comparison with its breadth, with an index of 67·9, that of the Eskimo being 68·4; finally the naso-malar angle of Flower, which measures the recession of the face behind the orbits, is very large, attaining the value of 145: in this respect also it makes a nearer

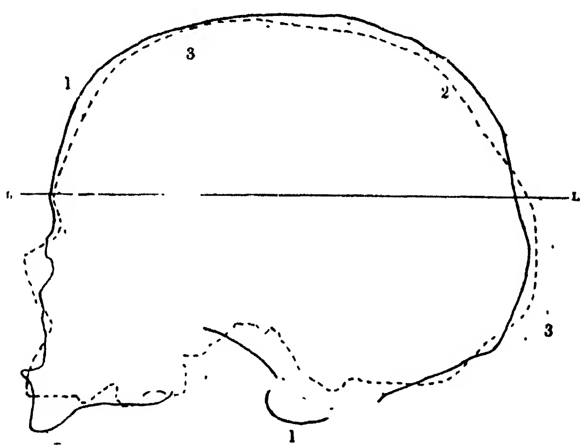

FIG. 337.—Profiles of (1), the Chancelade skull; (2), the Crô-Magnon skull, and (3), the skull of an Eskimo superposed on the glabella-lambda line as a base. (After Testut.) The comparative shortness of the Crô-Magnon face is obvious.

approach to the Eskimo, with a value of 144, than to any other known race.

The evidence could scarcely be more definite; the osteological characters of the Eskimo, which are of a very special kind, are repeated by the Chancelade skeleton so completely as to leave no reasonable doubt that it represents the remains of a veritable Eskimo, who lived in southern France during the Magdalenian age.[1]

[1] L. Testut, "Recherches Anthropologiques sur le Squelette Quaternaire de Chancelade, Dordogne," *Bull. de la Soc. d'Anthr. de Lyon*, viii, 1889.

In North America, as we have seen, a tall Indian race immediately succeeds the Eskimo towards the interior; and in Europe a tall Crô-Magnon race seems to have been associated with the short Chancelade people. If we have rightly identified the two short races one with the other, we shall next be tempted to suppose that some close bond of blood may have existed between the two

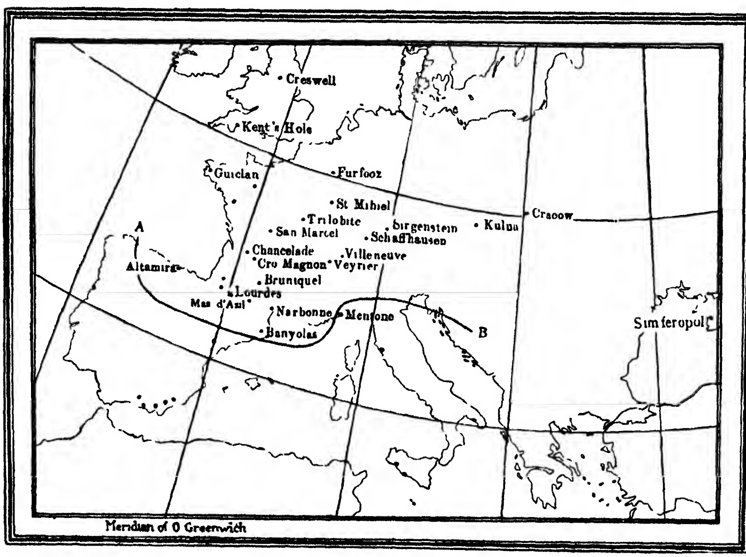

FIG. 338—Distribution of Magdalenian stations. The line A B divides the Northern from the Capsian province.

tall ones. There are, indeed, some characters which they possess in common, the Algonkians, in the eastern part of the continent, having long heads, like the Crô-Magnon men, and this in itself appears to be a remarkable fact, when we consider the rare occurrence of dolichocephaly among the Leiotrichi. The short faces and depressed orbits of the Crô-Magnon men mark them off, however, as a distinct race.

The Magdalenian culture extended (Fig. 338) east

from Altamira, through France, Switzerland, Germany, Bohemia, Moravia, and as far as Russian Poland, and it has been traced northwards to Belgium (Fig. 339), Kent's Hole in Devon and Creswell Crags in Derbyshire. Future discoveries alone can inform us as to the relative distribution of the two races, who probably shared this territory between them, but it is safe to suppose that the Chancelade race occupied the more northern stations, though all that is certainly known is its occurrence in southern France.

The Magdalenian is unknown in Italy and the greater part of Spain; and seems to be entirely absent from the Mediterranean province, where no doubt it is represented by the Capsian industry with its persistent Aurignacian characters. The question next arises as to how the existing Eskimo acquired their present distribution.

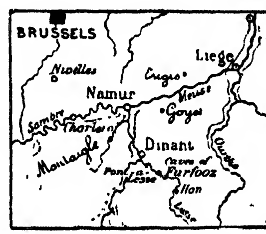

FIG. 339.—Upper Palæolithic stations in Belgium; Goyet is typically Magdalenian.

The Magdalenians are the latest Palæolithic races which inhabited Europe during the Glacial age: their successors on this soil were the Azilians, and these were followed by the Neolithic folk, who brought with them a pastoral or agricultural mode of life. It is fairly certain that these Neolithic folk were already in existence, previous to their entrance into the Magdalenian area, and if so, the time was almost certain to arrive when by a natural increase in numbers they would begin to exert a pressure on adjacent tribes. The chase is extravagant in the demands it makes upon territory; possibly a thousand farmers could exist on the land which would only support a single hunter.

Thus, from the very nature of their industry the Neolithic people could scarcely fail to grow strong numerically, and consequently capable of forcing their way into fertile regions in face of whatever resistance the hunters might oppose. Simultaneously with this pressure from behind, an attraction may well have arisen in front,[1] for towards the close of the Magdalenian age a steady amelioration of climate was in progress which especially affected the temperate zone; as a consequence the sub-arctic fauna which supplied the Magdalenian hunters with so large a part of their food, especially that important member of it, the reindeer, so highly esteemed by Indian and Eskimo alike, was shifting its limits towards the north.[2] In this connexion we may recall the fact that Magdalenian stations are known to occur well within the limits of the greatest extension of the ancient ice, as, for instance, at several localities in Switzerland, and at Creswell Crags in England. The cold fauna, represented by fossil remains of the reindeer, musk-ox, and walrus, is found in North America as far south as southern New Jersey, or in the adjoining region to the south and west; and it seems to be confined to superficial gravels, a fact which points to a comparatively late immigration. Possibly it was followed or accompanied by Magdalenian man.

Ingress to the North American continent might take place over Bering Strait and the Aleutian Islands, or across the Icelandic bridge. At first sight the latter route appears most promising. It is doubtful, however, whether at this time it was still standing; it had pos-

[1] This *vis a fronte* was probably the more important. See note by Dr. Stefansson on p. 596.

[2] "Those animals, accustomed to certain harsh environments, cling tenaciously to them and would rather perish than adapt themselves to new ones."—Wiegers, *Zeits. Deutsch. Geol. Ges.*, vol. lxiv, p. 578 (1912).

sibly ceased to be intact during Miocene times, and is generally supposed to have completely broken down before their close. Besides this, no relics of Magdalenian man have been discovered on those remnants of the bridge which still stand above water, nor on the neighbouring shores. Scotland has yielded none,[1] and the earliest human remains found in Scandinavia date from the Neolithic or perhaps the Azilian period. The more probable route would therefore appear to have lain over Bering Strait or the Aleutian Isles.[2]

Dawson has pointed out that the whole of the Bering Sea (west of long. 165° W.) together with Bering Strait and much of the Arctic Ocean beyond really belongs to the continental plateau, and that it formed in comparatively recent times a wide terrestrial plain connecting North America with Asia. This plain, like Siberia, was free from land ice and thus offered an open path by which man and the contemporary mammalia could pass from the Old World to the New. That it was actually made use of by some of the mammalia is shown by the presence of teeth and tusks of the mammoth in the Pribyloff Islands and Unalaska Islands.[3] In Alaska, according to Dall,[4] the remains of the fauna of the mammoth are widely distributed; associated with the mammoth itself are *Elephas columbi*, the musk-ox, reindeer, a horse (*Equus major*), an elk (*Alces Americanus*) and a bison (*Bison crassicornis*). Along the

[1] The perforated bone harpoons which have been found at Oban belong to the Azilian stage. Joseph Anderson, *Proc. Soc. Antiq. of Scotland*, xxix, p. 211, 1895.

[2] See A. Hamberg, *Om Eskimoernas härkonish och amerikas befolkande* Ymer, 1907, p. 15.

[3] G. M. Dawson, "Geological Notes on some of the Coasts and Islands of the Bering Sea and Vicinity," *Bull. Am. Geol. Soc.*, 1894, v, pp. 117–146.

[4] W. H. Dall, *Bull. U.S. Geol. Surv.*, 1892, No. 84, p. 266, and Stanley-Brown, "Notes on the Pribyloff Islands," *Bull. Am. Geol. Soc.*, 1892, iv, pp. 496–500.

Arctic coast, east of Point Barrow, their bones, scattered through a frozen clay, are so common that the Eskimo make use of them for implements; the mammoth ivory in particular is carved into household utensils. Dr. Scharff,[1] who contends that the Icelandic bridge between Europe and North America was still standing at the very close of the Pliocene times, does not go so far as to assert that it lasted into the Magdalenian age.

A general consideration of all the facts might, then, lead us to some such hypothesis as the following: During the Magdalenian age at least two races of dolichocephalic Leiotrichi, differing greatly in stature, extended from Western Europe to the east, across the entire breadth of Asia, occupying a zone which included much of the tundra and the steppes. They possessed a common Magdalenian culture, and resembled in their mode of life the Algonkians and Athapascans of the tundra as they existed before the advent of the white man, feeding on reindeer and the mammoth, horse and bison, together with various kinds of fish.

The taller, and probably more powerful, race held possession of the more favoured regions in the south, where the climate was less rigorous and game more abundant; the shorter race, hemmed in by its tall relations in the south and the ocean or the ice in the north, had to make the best of its inhospitable surroundings, and developed, thanks to its great intelligence, a special mode of life. No doubt other Leiotrichous races, but distinguished by broad heads, were in simultaneous existence in the more southern parts of Asia.[2]

[1] R. F. Scharff, "On the Evidence of a Former Land-bridge between Northern Europe and North America," *Proc. Roy. Irish Ac.*, 1909, xviii. sect. B, pp. 3–28.

[2] It is well known to all those who have associated with the most northerly Indians and the Eskimos to the north of them, that the Eskimos are a more energetic and able people. But what is not equally well known

As the climate became warmer, the pressure of the rapidly increasing Neolithic people began to make itself felt, acting probably from a region somewhere between the Carpathians and India. A movement of the Leiotrichi was thus set up towards the north; but as there was no room for expansion in that direction, it was diverted towards the only egress possible, and an outflow took place into America over Bering Strait or the Aleutian Islands.[1] The primitive Eskimo, already accustomed to a boreal life, extended along the coast. The primitive Algonkians, following close upon their heels, occupied the southern margin of the tundra, and extended east as far as the Atlantic Ocean. The broader-headed Athapascans came next, and gradually acquired possession of the western half of the southern tundra. The Eskimo were rigidly confined to the coastal regions, but there was nothing to arrest the progress of the primitive Red Indians towards the south —everything, indeed, seemed to invite them in that direction. No geographical barriers rise across the path, and game of all kinds was abundant, so that in no very long time the primitive Indians may have populated both the American continents throughout their whole length, from north to south. It is interesting

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is the fact that the Eskimos occupy what is probably the best hunting country in all North America. I do not believe that before the introduction of the horse even the plains Indians were as well off. It is only a small part of each year that the Eskimos need to devote to the pursuit of food. That is why they spend so much time in singing, playing and travelling about. Many Eskimos are as familiar with the woods as the open country, but prefer the treeless coast. The caribou are as numerous in the Eskimo as in the Indian country, perhaps more so; and then there is the priceless seal which by itself is more valuable and more to be depended upon than all the other animals, put together, that inhabit the spruce forest to the south. (Note by V. Stefansson.)

[1] Brinton has also expressed the opinion that the American race migrated from the Old World during the Neolithic period; also T. Wilson, "The Antiquity of the Red Race in America," *Smithsonian Report U.S. Nat. Mus.*, 1895, p. 1041.

to observe in this connexion that at the southern extremity of South America we still find a dolichocephalic Leiotrichous race, the Fuegians, who, though very inferior to the Eskimo in some respects, yet present many striking resemblances to them in bodily structure, implements, and mode of life.

The subsequent differentiation of the original Red Indian races—*i.e.* the primitive Algonkians and Athapascans—may have given rise to all the existing races of both the American continents, except along the western coast, where the occasional stranding of vessels from the east of Asia or the islands of the Pacific may have added a foreign element.[1]

That the Algonkian and Athapascan races once occupied a far larger area than they do now, or rather did before the invasion of modern Europeans, is shown not only by fossil remains found outside their present boundaries, but by circumscribed areas still inhabited by them, which are isolated from the main body of their race by alien tribes.

Recurring for a moment to the Eskimo, we may mention that Steensby,[2] as the result of a very interesting investigation, is led to conclude that the origin of the fully developed Eskimo culture must have occurred somewhere near the region of Coronation Gulf, where the conditions are peculiarly favourable for an "emancipation from forest life" and an adaptation to the environment provided by the Arctic coast. This view would not be wholly inconsistent with that which we have just sketched out; but it rests on resemblances between the implements and mode of life of the Eskimo and

[1] The fact that the ancient civilisations of Mexico and South America had adopted the same signs of the zodiac as the ancient Chaldeans, and recognised them by the same names, can scarcely be explained otherwise.

[2] H. P. Steensby, *Om Eskimokulturens Oprindelse*, Copenhagen, 1905.

Indians which are susceptible of a different explanation, and it is open to the serious objection that it completely fails to take into account the marked anatomical differences which distinguish the Eskimo from the Red Indian races.

If the views we have expressed in this and preceding chapters are well founded, it would appear that the surviving races which represent the vanished Palæolithic hunters have succeeded one another over Europe in the order of their intelligence: each has yielded in turn to a more highly developed and more highly gifted form of man. From what is now the focus of civilisation they have one by one been expelled and driven to the uttermost parts of the earth: the Mousterians have vanished altogether and are represented by their industries alone at the Antipodes; the Aurignacians are represented in part by the Bushmen of the southern extremity of Africa; the Magdalenians, also in part, by the Eskimo on the frozen margin of the North American continent and as well, perhaps, by the Red Indians, on the one hand, and, on the other, by the Guanches and sporadic representatives in France. It is a singular fact, when considered in connexion with the claims sometimes asserted in favour of the dolichocephalic skull, that in each of these ancient races, marked by so many primitive characters, a long head is distinctive. Surely this also is to be numbered among the primitive characters.

What part is to be assigned to justice in the government of human affairs? So far as the facts are clear they teach in no equivocal terms that there is no right which is not founded on might. Justice belongs to the strong, and has been meted out to each race according to its strength; each has received as much justice as it deserved. What perhaps is most impressive in each

of the cases we have discussed is this, that the dispossession by a new-comer of a race already in occupation of the soil has marked an upward step in the intellectual progress of mankind. It is not priority of occupation, but the power to utilise, which establishes a claim to the land. Hence it is a duty which every race owes to itself, and to the human family as well, to cultivate by every possible means its own strength: directly it falls behind in the regard it pays to this duty, whether in art or science, in breeding or organisation for self-defence, it incurs a penalty which Natural Selection, the stern but beneficent tyrant of the organic world, will assuredly exact, and that speedily, to the full.

CHAPTER XIII

THE AZILIAN AGE

THE last of the hunting races which roamed the soil of Europe were the people of the Azilian age. This takes its name from the cave of Mas d'Azil, where the relics of the Azilian industry, including the remarkable painted pebbles already alluded to, are found in the fourth layer (D) of the following series of deposits :—[1]

A.	Blackish clay, with Gallic pottery, and Gallo-Roman pins	0·2 —0·4 metre.
B.	Blackish clay, Bronze Age above, Neolithic below	0·3 —1·2 ,,
C.	NEOLITHIC, Arisian; implements and abundant snails' shells (*Helix nemoralis*),	0·1 —0·6 ,,
D.	AZILIAN, red loam, implements, remains of hearths, recent fauna	0·15—0·5 ,,
E.	Laminated yellow loam, sterile . . .	1·24 ,,
F.	UPPER MAGDALENIAN, black loam, implements, hearths and rare reindeer . . .	0·3 ,,
G.	Laminated yellow loam (rearranged löss ?), sterile	1·5 ,,
H.	MIDDLE MAGDALENIAN, implements, hearths and black loam; reindeer	0·83 ,,
I.	Gravel, sterile (7·4 m. above the river Arise)	1·46 ,,

The river Arise flows past the mouth of the cave, and the laminated loams (E and G) may have been formed by this river when in flood, and at a time when it had not sunk its bed so deeply into the land as at present.

The history of the hunting races is marked by a fluctuating progress; the movement is on the whole forwards, but is always open to retarding influences

[1] E. Piette, "Études d'Ethnographie préhistorique," *L'Anthropologie*, 1895, vi, p. 276.

by which it is sometimes arrested or even reversed. Such a retrogression seems to be marked by the Azilian age. With the advent of the Azilians the realistic art of the Magdalenians disappears and is succeeded by rude attempts at geometrical or generalised representation. There is no more working in ivory; this material has disappeared with the mammoth, and stag's horn takes its place. Needles are now unknown, and whatever sewing there is has to be done with an awl. In the working of flint there is a partial return to Aurignacian methods; the keeled grattoir, less finely finished, reappears, as well as the corner burin and a kind of Châtelperron point, while the pigmy flints which make a timid appearance in the Aurignacian, now undergo a sudden development, and become so characteristic of the time that they have received another name and are known as the "Tardenoisian." [1]

This deterioration, partial in industry and complete in art, is all the more remarkable when we consider the change for the better which has taken place in the environment. The ice-sheets have almost completely melted away, the arctic flora has yielded to the birch and the pine, and richly wooded landscapes have begun to replace the monotonous tundra and steppes. A great change has taken place in the fauna, the mammoth has finally vanished, the reindeer has retreated towards its

[1] We use the term Azilian in general to denote an age or stage which Dr. Obermaier designates "Epipalæolithic" and others less appropriately "Mesolithic." It includes the industries named Final Capsian, Tardenoisian and Azilian. They may differ slightly in age, the Final Capsian being perhaps slightly older than the two others; they have special importance as marking out geographical provinces. The Azilian is chiefly distinguished by its flat harpoons and the absence of trapezoidal forms from its geometric pygmies; the Tardenoisian by the presence of trapezoids and the absence of harpoons; the Final Capsian by its generalised figures. The Azilian industry of Cantabria may possibly be divided into two sub-stages, an older with pygmy implements which are rarely geometrical, and a younger with geometrical pygmies, flat harpoons and painted pebbles.

present home in the north, and the existing fauna, characterised especially by the red deer, has taken possession of the soil. It was the time of cattle, horses and pigs, all however as yet in the wild state, for the Azilians had not yet learnt how to domesticate these animals. What effect this change of fauna had upon the food supply it is impossible to say. The cold of the Glacial epoch had relaxed its grasp, and the climate was, if anything, a little warmer than it is at the present day.

It is possible that if we knew more about the Azilians we should find that they were not so retrograde as their relics would seem to imply. There is reason to believe that they had succeeded in taming the dog, and the assistance of this faithful companion in the hunt might well compensate for a want of finish in their weapons. Their poverty in art may be admitted and deplored, but it would be unfair to judge them by this alone; indeed, we might ourselves as a practical people protest against any criticism of our civilisation which should be based exclusively on, say, our sculpture or our architecture.

There is a difficulty in determining by what standard the civilisation of a hunting race is to be judged. If for the sake of illustration we take the social organisation, then on the whole the Red Indian might rank before the Eskimo. Yet if all we knew about these two races was derived solely from such of their implements as are likely to be preserved to future ages, we might fairly give the palm to the Eskimo. As to their work in flint the Indian is no doubt the superior, but in ivory all the advantages are on one side. The Eskimo also has the needle, while the Red Indian is content with the awl. Pottery of course must be reckoned to

the Indian, but the vessels carved out of soapstone by the Eskimo are an ingenious substitute and much better adapted to the conditions under which he lives.

The Eskimo, however, does not work in ivory from choice, but because wood is a rare and costly substitute; the Indian uses wood because, while satisfying all his

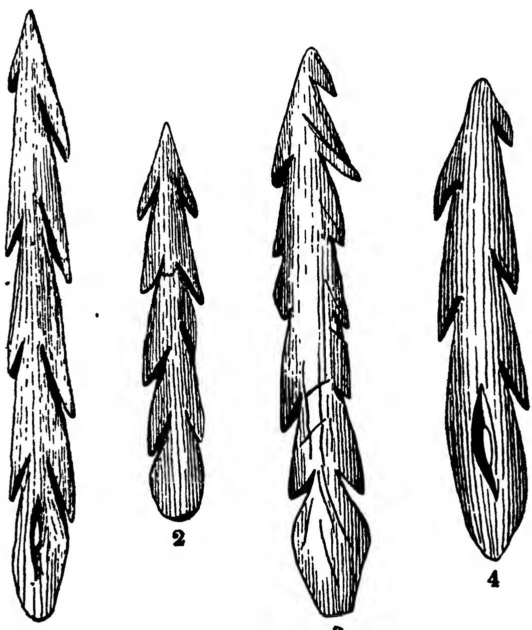

Fig. 340.—Azilian harpoons. 1 and 2, from Oban. (After Anderson.) 3, from the Grotte de Reilhac (Lot). (After Boule.) 4, from Mas d'Azil. (After Piette. All × ½.)

requirements, it is at the same time easily obtained and easy to work. So it may have been with the people of the Azilian age.

The characteristic Azilian implement is the harpoon (Fig. 340). It is broad and flat, with one, or more commonly two, rows of barbs, and generally, but not always, with a perforation near the base to take the line

by which it was attached loosely to the shaft. The hole may be round or elongate as in Fig. 340, 1 and 4. It owes its broad flat form to the structure of the stag's horn out of which it is roughly carved.[1] The interior

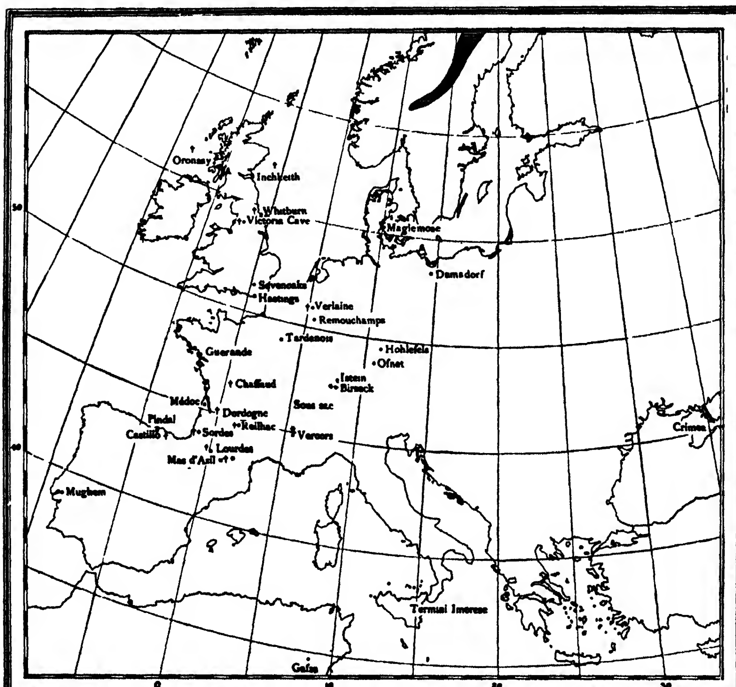

FIG. 341.—Map of the distribution of the Azilian industry. * Stations with painted pebbles; † with harpoons.

of the antler of the stag is much more spongy than that of the reindeer, and the harpoon is carved out of the dense compact outer layer. The Azilian harpoon,

[1] Obermaier stigmatises this as a "Märchen" because in Spain the round Magdalenian harpoons as well as the flat Azilian were made out of stag's horn. Possibly, however, this selection of the harder material may be regarded as the solitary improvement in weapons with which we can credit the Azilians (Obermaier, "Die Paläolithicum und Epipaläolithicum Spaniens," *Anthropos*, xiv–xv, 1919–20, p. 160.)

though coarsely made, was eminently "practical,' and the hole at its base is a definite improvement no found in the Magdalenian weapon except at Castill and elsewhere in the north of Spain; it outlived its age and is not uncommon in the Neolithic stations o Switzerland.[1] The only other implements in bone ar simple punches, awls, and smoothers (lissoirs). Th perforated teeth of the horse, wild boar and bear wer

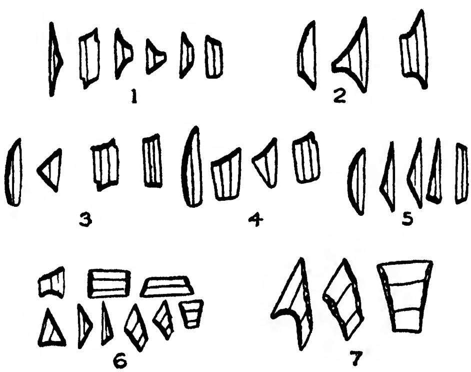

Fig. 342.—Geometric forms of Azilian age. 1, Upper and final Capsiar of Tunis and the south of Spain; 2, from the kitchen middens o Portugal; 3, Azilian of Valle (Santander) and elsewhere; 4, fina Azilian of the Landes and Belgium; 5, possibly early Tardenoisiar from Hastings and Sevenoaks; 6, Tardenoisian of France and Belgium 7, Neolithic forms evolved from the Tardenoisian. (After Breuil All much reduced.)

still used for personal adornment, and so were variou kinds of shells.

The harpoons, of which Piette found no less than a thousand at Mas d'Azil, occur also in the north of Spain,[2] at various stations in the south of France, the Dordogne

[1] The Swiss harpoons are said by Burkitt to be totally different from the Azilian. M. C. Burkitt, *Prehistory*, Cambridge, 1921, p. 151.

[2] A complete list of the localities where Azilian harpoons have been found is given by the Abbé Breuil, "Les subdivisions, etc.," *loc. cit.*, p. 233.

Belgium, England,[1] and as far north as Oban in Scotland [2] (see map, Fig. 341).

The flint implements are far more abundantly distributed than the bone harpoons; they include those modified descendants of the keeled scraper, the corner burin, and the Châtelperron point which make their first reappearance at the close of the Magdalenian, to continue in some localities into the Azilian; but the most characteristic and widely distributed forms are those little geometrical flakes (Fig. 342), rhombs, trapezes triangles, and segments of circles, generally spoken of in this country as "pygmies," but otherwise known as the Tardenoisian industry, from their occurrence in large numbers at Fère-en-Tardenois (Aisne). What purposes were served by these tiny flakes is a question not so easy to answer. It has been suggested that some were used for tattooing, and this may have been one of the less important of the probably numerous uses to which they were put. It seems probable that the great majority were inserted into wooden handles, often, probably, in straight rows, and secured in position by some cement [3] (Fig. 343). In the Neolithic age, bone harpoons (Fig. 343) have been discovered with a groove on one or both sides, in which a row of thin flints had been inserted and fixed by some kind of black gum or rosin, and at the present day a method similar in principle is practised in the South Seas. Dr. Munro [4] figures a double-handed saw from a lake dwelling at

[1] Victoria cave (Boyd Dawkins, *Cave Hunting*, London, 1874, p. 112, fig. 26) and Whitburn (R. Munro, *Palæolithic Man*, Edinburgh, 1912, p. 270).

[2] J. Anderson, "Notice of a Cave recently discovered at Oban," *Proc. Soc. Antiq. Scot.*, 1895, xxix, p. 211; 1898, xxx, W. J. L. Abbott, "The New Oban Cave," *Nat. Sci.*, 1895, vi, p. 330. M. Boule, "Les Cavernes d'Oban," *L'Anthr.* 1896, vii, p. 319. See also R. Munro, *op. cit.* p. 261, *et seq.*

[3] This suggestion, which was not very favourably received when first made, is now adopted by Montelius (O. Montelius, "Palæolithic Implements found in Sweden," *The Antiquaries Journal*, i, p. 98, 1921).

[4] R. Munro; *op. cit.*, p. 378, and frontispiece.

Polada, in Northern Italy, which is constructed on the same plan.

For a long time the relative age of the Tardenoisian industry remained a perplexing problem, but in 1909 a discovery by Messrs. Breuil, J. Bouyssonie and Obermaier[1] provided the solution. They found in the cavern of Valle, near Gibaja (Santander), beneath a layer of stalagmite, a typical Azilian layer containing several characteristic harpoons, and an intercalated accumulation of snail shells (Helix), such as commonly accompany deposits of this age. Immediately below the Azilian came the Magdalenian; above, it was sealed up by a layer of stalagmite.

Flint implements abounded in this Azilian layer, and included all the forms which are most characteristic of the Tardenoisian. It is therefore clear that the Tardenoisian corresponds, at least in part, with the Azilian; at the same time it does not follow that the Tardenoisian industry is everywhere of the same age. Like so many other of the ancient industries, it may even have persisted down to the present day.

Fig. 343.—A Neolithic harpoon armed with pygmy flints. (After Madsen, from Kossinna. × about ⅘.)

In the west of Europe, Azilian stations distinguished by pygmy implements are distributed over a great part of France (Fig. 341); they occur at Mughem in

[1] H. Breuil et H. Obermaier; "Les premiers Travaux, etc.," *L'Anthr.*, 1912, xxiii, p. 2 *et seq.*

Portugal,[1] in Southern Spain,[2] the south of England at Hastings[3] and Sevenoaks,[4] in the north (East Lancashire),[5] and in Belgium at Remouchamp[6] and Zonhofen.[7] They also occur as the final term of the Capsian around the shores of the Mediterranean, as at Mentone, in Sicily, Tunis (Gafsa), Egypt (Hélouan), and Phœnicia (Ras Beyrouth). To the east they are found in the

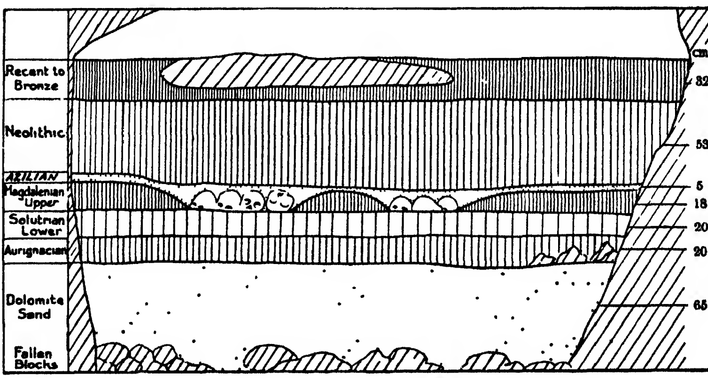

FIG. 344.—Section through the cave of Ofnet and its deposits. (After R. R. Schmidt.)

Crimea, Poland (Ossowka), India (Vindhyan hills), Banda and Japan.

In Southern Germany Dr. R. R. Schmidt[8] has

[1] Ribiero, "Les Kjœkkenmœddings de la vallée du Tage," *Congrès International d'Anthropol.*, Lisbon, 1880.

[2] H. Breuil, "Les Subdivisions, etc.," *loc. cit.*, p. 223.

[3] W. J. L. Abbott, "The Hastings Kitchen Midden," *Journ. R. Anthr. Inst.*, 1895, xxv, p. 122; "Primæval Refuse Heaps at Hastings," *Nat. Sci.*, 1895. (Pottery, however, was associated with the pygmy implements here.)

[4] *Ibid.*, "Notes on a Remarkable Barrow at Sevenoaks," *Journ. R. Anthr. Inst.*, 1895.

[5] Dr. Colley March, *The Neolithic Men of Lancashire.*

[6] Baron de Loé et Rahir, "Note sur l'exploration des plateaux de l'Amblève, etc.," *Soc. Anthrop. Bruxelles,* 1903 (here accompanied by the reindeer).

[7] H. Nandrin and Servais, "Contribution à l'étude du préhistorique dans la Campine Limbourgeoise," *Congrès de la Fédération archéol. et hist. Belg.*, Liège, 1909.

[8] R. R. Schmidt, "Die vorgeschichtlichen Kulturen der Ofnet," *Ber. d. Nat.-Wiss. Ver. f. Schwaben u. Neuberg,* 1908, pp. 87–107, in particular pp. 99–103.

described an interesting station at Ofnet (Fig. 344), where the Azilian, without harpoons but with numerous Tardenoisian flints, immediately overlies the Magdalenian. It is remarkable for the great number of human skulls which were found arranged in groups, like eggs in a nest, and buried in red ochre. One nest (Fig. 345)

FIG. 345.—Nest of human skulls found in the Azilian layer at Ofnet. Round the skull in the left-hand lower corner is a chaplet of deer's teeth. (After R. R. Schmidt.)

contained twenty-seven skulls, all orientated in the same direction, looking towards the setting sun. No other bones of the skeleton, except a few vertebræ of the neck, were found with them. The presumption is that after death the body was decapitated, the head preserved, and the rest of the body consumed on a funeral pyre.[1] Strings of perforated shells and deer's teeth,

[1] Count Bégouen made a close examination of the vertebræ and found the marks left by the flint knife used for severing the head from the body;

worn during life as necklaces or chaplets, were found buried with the skulls. On the skull of a little child hundreds of shells lay close together, placed there, no doubt, by some sad, affectionate hand.

Through the kindness of Baron von Huene I was able to examine these skulls in the Geological Museum at Tübingen, and satisfied myself of the absence of any close affinities with skulls of Magdalenian age. They have since been described by Dr. Schliz,[1] who finds that some of them are long-headed and the rest short-headed. With the short heads (index 80·4 to 88·9) he associates the medium broad heads (index 75·7 to 78·9) to form a group which is then subdivided by the shape of the skull, into two sets, one which Dr. Schliz regards as representing the existing Alpine race, and another which he allies with the people who built the Neolithic pile dwellings. The Alpine race at the present day occupies high lands and mountains over an area which extends from the Himálaya through Asia Minor, the Balkan peninsula, and Western Germany to Central France and Brittany.[2] The long heads (index 70·5- 73·8), which, in contrast to the Crô-Magnons, are harmonious, *i.e.* combine a long face with a long skull, are supposed to be connected with the Mediterranean race now distributed around the shores of the Mediterranean, a people of short stature to whom must be reckoned the Libyans, Iberians, Ligurians and Pelasgians, as well as a part of the population of ancient Egypt. Dr. Schliz's theoretical views in general are, however, of a very imagina-

in one instance several attempts had evidently been made to find the joint, and in the final effort a little bit of one of the vertebræ had been sliced off. (Le Comte Bégouen, ". . . sur la Décapitation . . . ," *Bull. Soc. Préhist. Française*, March 29, 1912.)

[1] A. Schliz, in R. R. Schmidt, *Die Diluviale Vorzeit Deutschlands*, Stuttgart, 1912, p. 241 *et seq.*

[2] A. C. Haddon, *Races of Man*, London (no date), p. 15.

tive kind; he is one of the very few who think with Dr. Klaatsch that the Neandertal men were descended from the gorilla and the man of Galley Hill from the orang; beside this he thinks for his own part that the Alpine race are descendants of the gibbon!

At Oban the Azilian deposits were found in a sea cave which yielded the following succession:—

A superficial layer of black earth.	
Upper shell bed	2 ft. 3 in. to 3 ft.
Pebbly gravel	1 ft. 6 in.
Lower shell beds, a lenticular intercalation.	
Pebbly gravel	4 ft.
Rocky floor.	

The shell-beds, which resemble one another in all essential respects, are true kitchen middens, composed of the shells of edible molluscs, such as oysters, limpets, whelks, periwinkles, cockles, razor-shells, and scallops, all of the largest size, as well as the big claws of crabs, the bones of large sea fish, and of mammals such as the red deer, the roe deer, goat, pig, badger, otter, dog, and cat. They contain also the remains of hearths—ashes and charcoal—numerous flint implements, hammer stones and scrapers, bone pins, awls and smoothers, in addition to the characteristic Azilian harpoons, of which seven specimens were found. Some human bones occurred at the surface of the ground as well as in the shell beds; there were two skulls of great cranial capacity (1715 c.c.), which Sir William Turner [1] compares with those of the British long barrows; unfortunately, these were among the specimens found at the surface, so that their age is uncertain; there were also some long bones—a femur, displaying that flattening of the shaft which is known as platymery, and a tibia,

[1] Sir William Turner, "Human and Animal Remains found in Caves at Oban," *Proc. Soc. Antiq. of Scotland*, 1895, xxix, pp. 410–438.

also with a flattened shaft or platycnemic. This flattening of the shafts of the femur and tibia has been attributed to the habit of squatting cross-legged, but Sir William Turner thinks that it is due to strenuous muscular exercise, as in hunting, walking over rough ground, or climbing steep hills. The height of the adult man represented by the femur is estimated as 1654 mm., or 5 ft. 4 in.

The cave opens upon a raised beach about 30 feet above the present sea level, and at the time it was occupied by man it was just out of reach of the waves, except during unusually high tides, when the pebbly gravel was washed in. Since then the land has risen nearly 30 feet, carrying the cave with it. This is a point of considerable interest, for the 20 to 25 feet beaches of Scotland and Ireland have long been known to contain implements of Neolithic age.[1] At Glasgow, one of these raised beaches on which the town is partly built has yielded to the excavator no fewer than eighteen dug-out canoes.[2]

Successive raised beaches border here and there the coast of Scotland; not to mention those at higher levels, there is one at 100 feet, another at 50 feet, and on this it is said some of the valley glaciers of the Great Ice Age have left remnants of their moraines;[3] these were formed during pauses in a long-continued elevation that accompanied the dwindling of the ice. Whether any 20 or 25 feet beach belongs to this series is unknown, but the elevation continued till the land stood a little higher than it does now, and peat and forest growth, characterised by the oak and therefore Neolithic, covered

[1] G. V. Du Noyer, "On Worked Flints from Carrickfergus and Larne," *Quart. Journ. Geol. Soc.*, 1868, xxiv, p. 495.
[2] Archibald Geikie, *The Scenery of Scotland*, London, 1865, p. 324.
[3] Sir A. Geikie, *Text-book of Geology*, London, 1893, p. 1044.

wide stretches of boulder clay right down to the edge of the sea. Then the land began to sink, shell-bearing clays were deposited over the peat, and on these, as the land once more came to rest, coarser sands and gravels were laid down This occurred when the land stood from 20 to 25 feet lower than it does at present, then elevation once more set in, and continued till the existing level was attained. According to Mr. Lloyd Praeger, all the 20 feet raised beaches of Ireland belong to this last episode, and if the shell-beds of Oban with their harpoons are of the same age, they must be Neolithic, not Azilian. It seems probable, therefore, that they belong to the earlier ascending beaches which are older than the submerged forests.

Azilian pebbles have since been found elsewhere [1]; indeed, two had already been found at Crouzade, near Narbonne, in 1874, long before Piette made his famous discovery; these were deposited in the museum at Carcassonne and forgotten, till M. Cartailhac rediscovered them: the subsequent finds were made at Vercors [2] (Drôme) and Birseek,[3] near Bâle. Those found at Birseek had all been broken across, no doubt intentionally, and if, as is supposed, by an enemy, it would seem that some special importance was attached to them.

The pebbles at Mas d'Azil came from the bed of the Arise; the red ochre with which they were painted was

[1] "In a rock shelter about 200 feet above the beach [in Taltal] I found certain rounded stones polished and daubed all over with red paint." Oswald H. Evans, "Notes on the Stone Age in Chile," *Man*, vol. vi, p. 22.

[2] H. Müller, "Notes sur les Stations Aziliennes des Environs de Grenoble," *C. R. Congrès Internat. d'Anthr.*, Geneva (1912), 1913, i, p. 558 *et seq.*

[3] F. Sarasin, "Les Galets coloriés de la Grotte de Birseek près Bâle," *C. R. Congrès Internat. d'Anthr.*, Geneva (1912), 1913, i, p. 566 *et seq.*, and *Globus*, 1910.

ground between stones and mixed with some menstruum, probably fat, in a pecten shell. Several of these primitive palettes were found in the cave. The designs upon the pebbles are extremely various; among the simplest are parallel stripes ranging in number from one to eight, but never reaching nine. These were interpreted by Piette as numerical signs, each representing a unit. Circular spots are common, and though a good many may occur on one stone, they always avoid the number nine; Piette thought these marked tens, or perhaps some other collective number, probably the nine. The most remarkable forms are those which resemble letters of the alphabet, like the F E I, in Fig. 46. Piette [1] regarded this as more than a mere coincidence; he thought these marks were genuine Roman characters, while there were many others which he identified with Cypriote, Ægean and Phœnician characters. He even supposed that Mas d'Azil was a great school where the Azilian boys were taught reading, writing, and arithmetic, as well as the rudiments of religion. No one has been found to support these views, and there can be no doubt that the resemblance of some of the signs to letters is purely accidental. Similar coincidences are known among people who when they write do not make use of an alphabet, as, for instance, the North American Indians; an engraved stone found in Batcreek mound,[2] Tennessee (Fig. 346), presents several of the same characters as those found on the painted pebbles, as well as others which occur on the walls of caves or rock shelters. Altogether, out of the eight symbols of this inscription, there are at least five which are

[1] E. Piette, "Notes complémentaires sur l'Asylien," *L'Anthr.*, 1903, XIV, p. 641 *et seq.*
[2] C. Thomas, "Mound Explorations," *Ann. Rep. Bur. Ethn.*, 1894, xii, p. 394.

met with among late Palæolithic paintings. Similar forms have also been recorded from Australia; in one

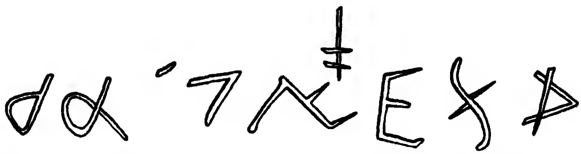

FIG. 346.—Inscription on a stone from Batcreek Mound, Tennessee. (After C. Thomas.)

case they are painted as a decoration on a woman's dilly basket [1] (Fig. 347); in another, they are engraved,[2]

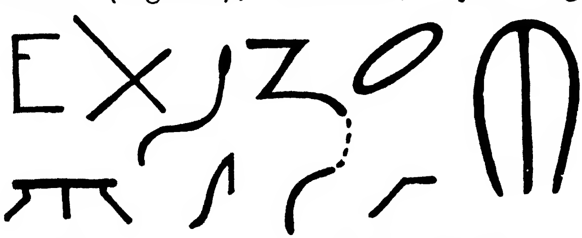

FIG. 347.—Characters occurring in the design of a dilly basket, Australia. (After Edge-Partington.)

sometimes an inch deep, on the face of a hard sandstone rock, as at Pigeon Creek in Queensland. Some of these

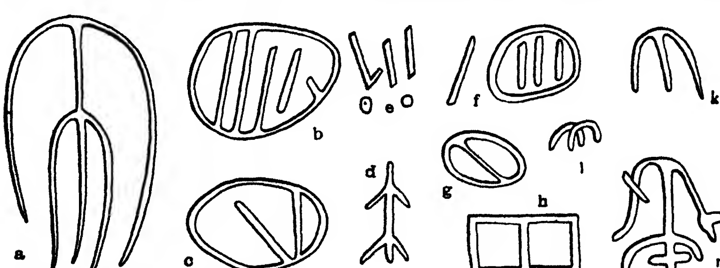

FIG. 348.—Incised signs from Pigeon Creek in Queensland. (After Tryon.)

characters are rather widely distributed (Fig. 348, *d*, a common sign for a man), and some (Fig. 348, *b*, *c*, *f*, *k*)

[1] J. Edge-Partington, *Album, Natives of Pacific Isles*, 1898, 3rd series, pl. 99.

[2] H. Tryon, "On an Undescribed Class of Rock Drawings by the Aborigines of Queensland," *Proc. Roy. Soc. Queensland*, 1884, i, p. 45 *et seq.*

remind us of some of the marks on the painted pebbles. Their association is certainly suggestive, and while refusing to accord them an alphabetical significance, we may admit that they were some kind of conventional sign. A very illuminating comparison has been made recently by Dr. Obermaier to which we shall refer later.

It is difficult at present to be certain in all cases of the age of the latest of the mural paintings which have

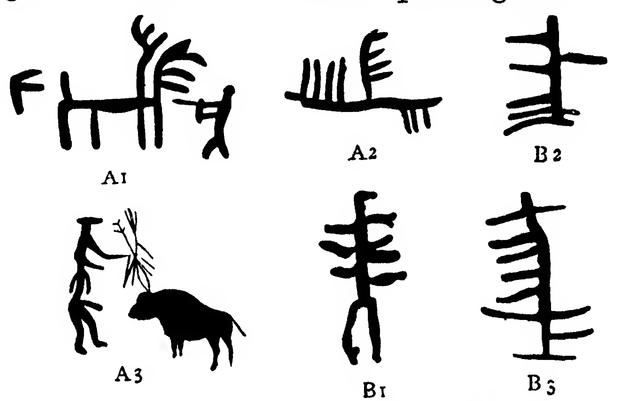

FIG. 349.—Generalised paintings (A) by the men of Cogul and (B) by the Bushmen. A1, a man attacking a stag; A2, a stag which he has already killed (A1, 2, Azilian); A3, a man attacking a bison (A3, Magdalenian); B1, a human figure (?). (From Cape Colony, after Moszeik.) B2, B3, some kind of mammal (?). These last two are turned out of position, so as to stand on their heads. (All much reduced.) (A, after Breuil; B, after Tongue.)

been discovered in Southern France and Spain, but without doubt a goodly number are Azilian, while some may be later.

The latest paintings at Cogul (Fig. 349, A1, 2) are probably Azilian.

Similar generalised forms are found in the Bushmen's country (Fig. 349, B), and, together with others also of an Azilian character, in Ceylon (Fig. 350). Of these latter a most interesting and valuable account has been given by Dr. and Mrs. Seligmann.[1] The quadrupeds

[1] C. G. and B. Z. Seligmann, *The Veddas*, Cambridge, 1911.

represented are the Sambar deer (Fig. 350, *j*), a dog (Fig. 350, *g*), and an elephant (Fig. 350, *f*), which a man is shooting with bow and arrow. The radiated circles would almost certainly have been interpreted as solar, and probably connected with sun worship, if we had not been told that they are simply *maludema,* i.e. vessels made of deer hide in which honey from the rocks is collected; the rays are merely looped handles made from some kind of creeper, the spots in the interior represent the honey. The symbols for men (Fig. 350,

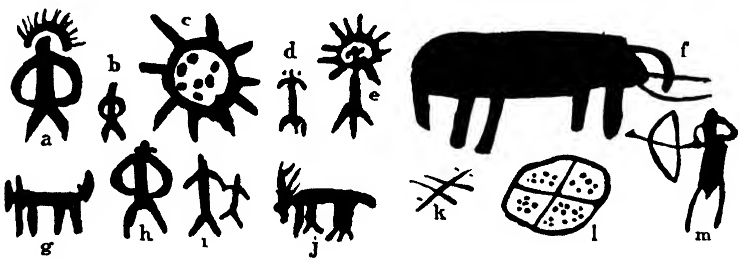

FIG. 350.—Paintings by the Veddas (Ceylon). (After Dr. and Mrs. Seligmann.)

d, *e*, *m*) and women (Fig. 350, *a*, *b*, *h*, *i*) are almost precisely similar to some of the Azilian and to others which have been found in the Soudan and in Bushman's land. The mysterious-looking rays about the heads of the figures *a* and *e* have nothing to do with haloes or plumed coronets; they are simply meant to show that the hair is tied up in a knot.

These paintings are made with a paste of ashes and saliva daubed on with the finger. Of mystic meaning they have none; they are only made by the women to amuse themselves while waiting for their husbands' return from the hunt.

A vast number of generalised forms have been described by the Abbé Breuil from the caves and rock

shelters of Spain; we must content ourselves with a single group (Fig. 351) representing various generalisations of the human form and the evolution of figures derived from it. In the second series (*bb*) of the first line we commence with forms like those we have seen in Ceylon, and arrive in the sixth figure at the letter ϕ.

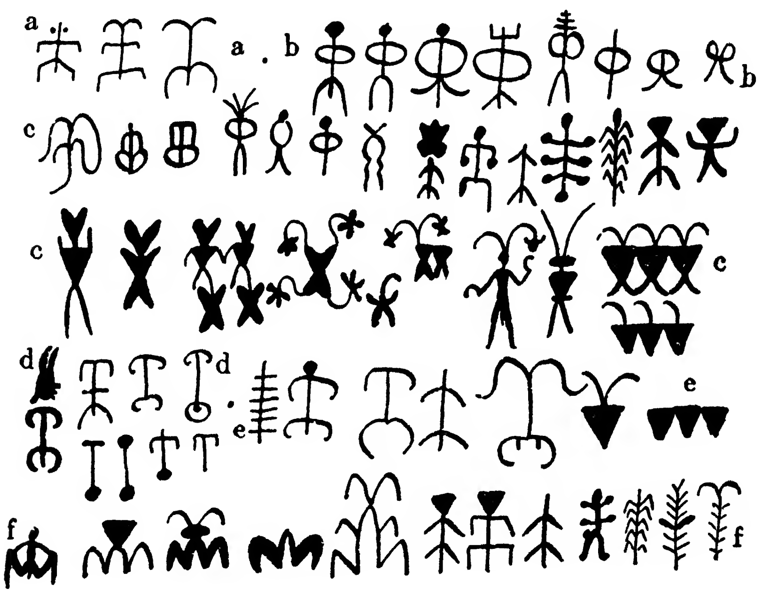

FIG. 351.—Generalisation of the human form. First line, *aa*, from Lubrin (Almeria) and *bb*, Jimena (Jaen). Second and third lines, *cc*, from Velez Blanco (Almeria). Fourth line, *dd*, from La Golondrina, and *ee* La Batanera (both Fuencaliente). Fifth line, *ff*, La Piedra Escrita (Fuencaliente). (After Breuil, *L'Anthr.*)

In the middle and at the end of the third line a combination of generalised forms affords the rudiments of decorative design.

The interpretation which Prof. Breuil has thus found for the strange signs in this evolutional series has acquired additional value since Dr. Obermaier has called attention to the close resemblance, amounting almost to identity,

between them and some of the signs painted on the Azilian pebbles (Fig. 352). Thus these also represent a human being and possibly differ in character from one another because they represent different individuals.

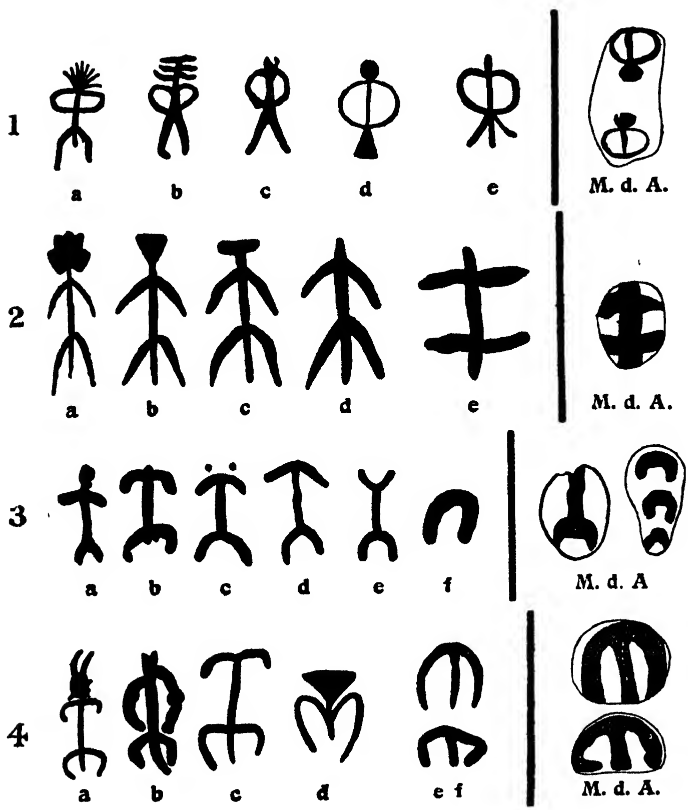

FIG. 352.—Generalised representations of the human form occurring a petroglyphs in the south of Spain (*a–e*) and on the painted pebbles of Mas d'Azil (M. d. A.).

Series 1. *a, b, c, e* from Jimena; *d* from Covatillas.

Series 2. *a,* Fuente de los Molinos; *b, c,* Fuencaliente; *d,* Vélez-Blanco; *e,* Barranco de la Cueva.

Series 3. *Female forms.* *a,* Prado de Reches; *b,* Barranco de la Cueva; *c, d,* Ranchilles; *e,* Prado de Reches; *f,* Barranco de la Cueva.

Series 4. *Male forms.* *a,* La Golondrina; *b,* Azogue; *c,* Tabla de Pochico; *d,* Cueva de los Letreros; *e,* Cimbarillo de Maria Antonia; *f,* Azogue.

Such a conclusion is supported by the painted Tasmanian pebbles mentioned by Backhouse (*v.* p. 116) and the statement by the Tasmanian woman that they stood for absent friends, or friends a long way off (? dead). These may have been the Tasmanian equivalents of churinga.

In the north of Europe, Scandinavian archæologists have long recognised a Stone Age which is older than the shell mounds or kitchen middens of the coast, *i.e.* than the horizon (Campignian) which is usually accepted as marking the first appearance of the Neolithic stage —and recent investigations seem to show that this earlier age is contemporary with the Azilian.

The subject is of great interest and growing importance, but we can only treat it here very briefly. We will commence with a short outline of the history of the Fenno-Scandinavian area during the retreat of the ice at the close of the last Ice Age.

The researches of Brøgger, De Geer, Munthe, and Sederholme have given us a clear picture of the changes in the configuration of land and sea which accompanied the retreat of the great Baltic glacier.

During the fourth or last Glacial episode the ice covered all the region left white in the accompanying figure (Fig. 353, 1); as it melted away Scandinavia was revealed as an island (Fig. 353, 2, 3) and the Baltic as a wide channel—the Yoldia sea—open from end to end. The marine animals of the time now live in the far North, and their remains indicate a temperature of the water never above 1° C., and more usually ranging from 0° to —2° C. Among the most characteristic species is the bivalve shell, *Yoldia arctica*, from which the sea takes its name.

The flora of the period (Dryas flora) was also Arctic;

it includes the arctic willow (*Salix polaris*) and the little creeping *Dryas octopetala*, and indicates a summer temperature (July) of at least 5° to 6° C.

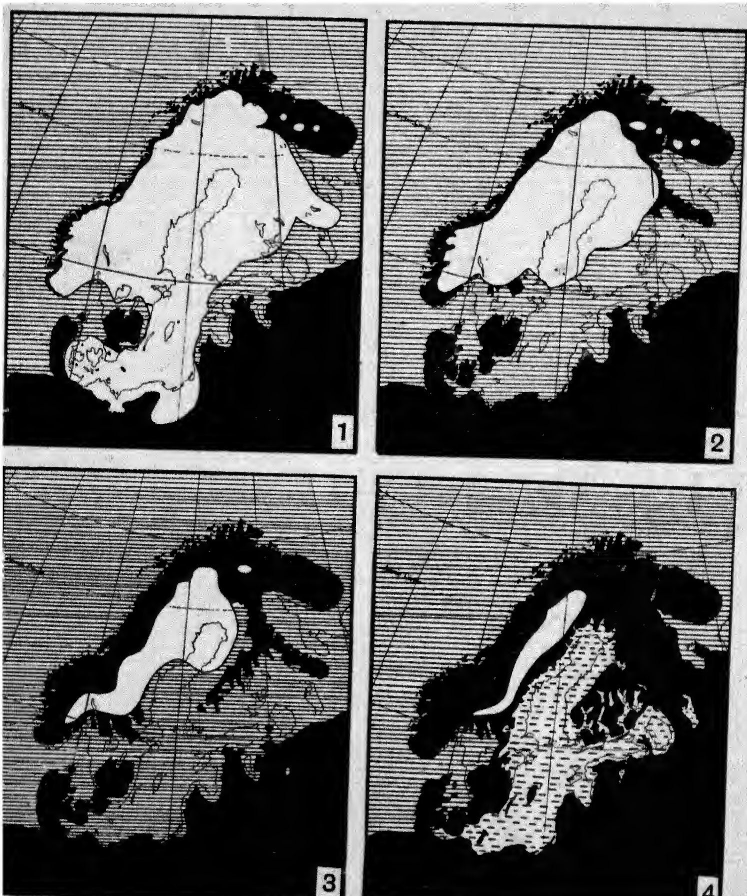

FIG. 353.—1, Fenno-Scandia in the fourth Glacial episode; 2, the Yoldia sea during the retreat of the ice; 3, the Yoldia sea at its maximum development; 4, the Ancylus lake. The ice—white; land—black; sea—horizontal lines; lake—horizontal broken lines. (After G. de Geer.)

At first when the ice commenced its retreat the land began to sink, and continued to do so till it stood 240

metres lower than at present, but as the ice continued to dwindle away the subsidence ceased and elevation set in, till at length the Yoldia sea was shut off from the open ocean, *i.e.* on the north from the White Sea and on the south from the North Sea. It was thus converted into a great fresh-water lake (Fig. 353, 4)—the Ancylus lake, so called from the abundance of a little limpet-shaped shell (*Ancylus fluviatilis*) which is found along with other fresh-water species in the sediments deposited from its waters.

As the Ancylus period drew towards its close a new flora coming from the south displaced the Arctic plants, and forests of birch, aspen, and pine took possession of the land.

It was at this time that Azilian man made his first appearance in this region.

After the final shrinking of the ice, the southern half of Scandinavia again began to sink beneath the sea, the waters of the German Ocean once more flowed through the Cattegat, and the Ancylus lake was transformed into the Littorina sea. A great amelioration of climate marks this time. Oysters, abundant and in good condition, flourished in the warm Littorina waters, as well as the little univalve, *Littorina litorea*, which gives its name to the sea. On the land the pine and the birch gave place to the oak with its mistletoe, the lime and the elm, and the hazel which extended considerably further north then than it does now.

The widest extension of the Littorina sea corresponded, indeed, with a "climatic optimum," when, as shown by abundant and concurrent testimony from various sources, the temperature was as much as $2\frac{1}{2}°$ C. higher in summer, while no lower in winter, than it is at the present day.[1]

[1] R. Ll. Praeger, "Report on the Raised Beaches of the North-east of

It was during this favoured time that Neolithic man entered the Baltic area, and left behind those vast accumulations of oyster-shells which compose for the greater part the famous kitchen middens of the Campignian age.

After the Littorina subsidence, an elevation of the Fenno-Scandian area commenced, and has continued, though at a diminishing rate, down to the present day.

The Azilians occupied the Baltic provinces and entered Norway and Sweden over dry land. One of their most important stations was in Maglemose [1] (the great bog) near the harbour of Mullerup on the west coast of Zealand. In the Ancylus time the bog was a fresh-water lake which was subsequently filled up by a growth of peat. The Azilians lived out in the lake, 350 metres from the shore, on a great floating island or raft of pines anchored in shallow water. Refuse and implements dropped through the raft into the water and are now preserved beneath the peat. Our knowledge of these relics is mainly due to the distinguished archæologist of Copenhagen, Dr. Sarauw.[2] They include a great number of flint implements—scrapers, axes, borers, and Tardenoisian flakes; also of horn and bone-sockets for axe-heads, chisels, needles, awls, beads,

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Ireland, with special reference to their Fauna," *Proc. Roy. Irish Acad.*, 1896, iv, pp. 30–54; W. C. Brøgger, *Senglaciale og postglaciale nivåforandringer i Kristianiafeltet*, Kristiania, 1900–1901, p. 449 and p. 705; also *Strandliniens beliggenhed under stenalderen i det sydøstlige Norge*, Kristiania, 1905, p. 87 *et seq.* and p. 305. Gunnar Andersson, "The Climate of Sweden in the Late-Quaternary Period," *Sveriges Geol. Undersöknings Arsbok*, 1909, p. 88; Gerard de Geer, "A Thermographical Record of the Late-Quaternary Climate," *Postglaziale Klimaveränderungen*, Stockholm, 1910, p. 309.

[1] Sophus Muller, *Urgeschichte Europas* (German translation), Strassburg, 1905, p. 16.

[2] G. F. L. Sarauw, *En Stenolden Boplads: Maglemose ved Mullerup*, 1903; *ib.*, "Trouvaille faite dans le nord de l'Europe datant de la période de l'hiatus," *Congrès préhist. de France*, Périgueux, 1905.

spear-heads, harpoons, fish-hooks and smoothers. Some of the latter class are adorned with various devices, or bear naturalistic representations of wild animals, in-

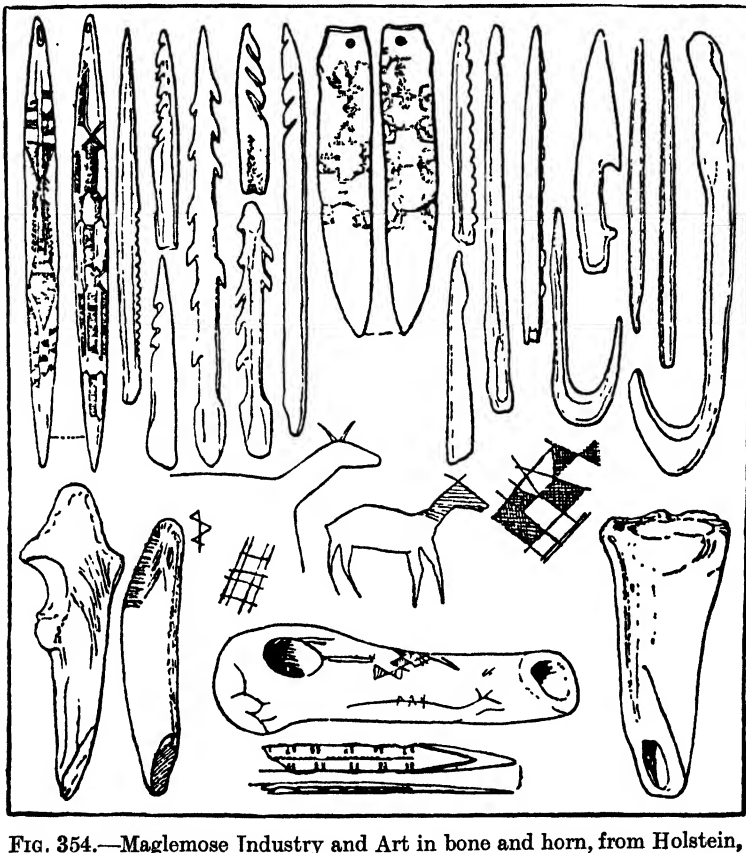


FIG. 354.—Maglemose Industry and Art in bone and horn, from Holstein, Hannover, Brandenburg, West Prussia and Denmark. (After Reinecke, from Obermaier. × ¼ about.)

cluding the elk, stag, wild boar, beaver, wild cat, and many others (Fig. 354). A great quantity of charcoal and decayed branches of trees was found, all derived from the pine, birch, poplar, hazel and elm, without a trace of oak, thus testifying to the Ancylus age. This is

one of the stations at which the bones of the dog, said to be a domesticated variety, have been discovered.

The Maglemose industry is widely distributed around the Baltic, it occurs in North Germany, from Hanover to the east of Prussia, in Denmark, the south of Sweden, and in the Baltic provinces. Dr. Grewingk has described it from a bog near Kunda in Esthonia, where it is distinguished by its richness in bone harpoons (some recalling the Magdalenian, others the Azilian) and in Tardenoisian or pygmy flints.[1] Prof. Kossinna has also called attention to harpoons of elk horn with one or two rows of barbs, and flat harpoons of stag's horn found in Kiel harbour near Ellerbeck.[2] Even a shaft-straightener of stag's horn, bearing an engraved linear design on one side filled in with a black cement, has been found by Dr. Schoetensack at a depth of seven metres in a peat bog near Kleine Machnow, Havel.

Rock engravings which date from the beginning of the Bronze Age have long been known in Norway and Sweden; others, however, have recently been discovered which differ greatly in character, and if they occurred in France or Spain would doubtless be assigned to the late Aurignacian or early Magdalenian. Only ten of these are known, three in Jämtland, Sweden; the rest in Norway. They cannot have been incised in Littorina times, for some lie below what must have been the level of the Littorina sea; nor in Yoldia times, for their site was then covered by the ice, and they may therefore be safely referred to the Ancylus or Azilian age. They are naturalistic representations of the elk, bear, and

[1] E. Grewingk, *Geologie und Archæologie des Mergellagers von Kunda in Estland: ib.*, "Die neolithischen Bewohner von Kunda in Estland und deren Nachbarn," *Verh. d. gelehrten Estnischen Ges. zu Dorpat*, 1884, xii.

[2] G. Kossinna, "Der Ursprung der Urfinnen, etc." *Mannus*, 1909, i, p. 17 *et seq.*

reindeer (Fig. 355). At Böla, near Trondhjem, we have in addition to the reindeer two sketches of the elk, each three metres long and two metres high; they are covered with much later drawings of ships and men.

Recently two similar stations have been discovered in England, one at Skipsea and the other at Hornsea,

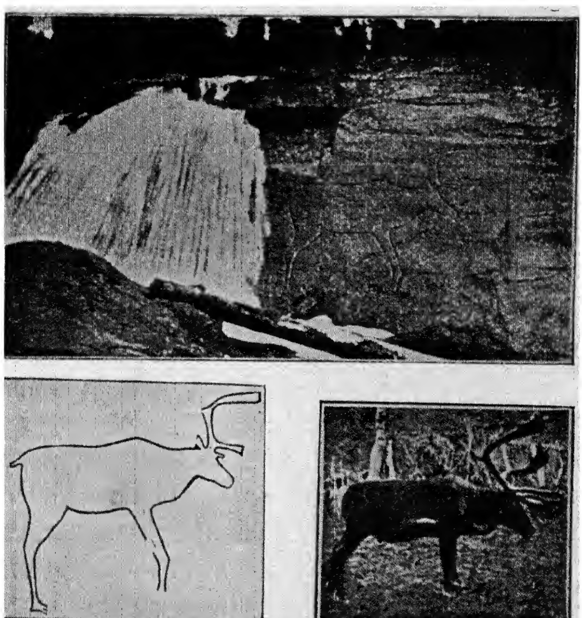


FIG. 355.—Incised outline of a reindeer from Böla, Trondhjem fjord. 1, Photographed in place; 2, a tracing from 1, for comparison with 3, a photograph of a reindeer. (After Kossinna.)

both on the coast of Holderness. They repeat the history of Maglemose, a shallow lake, held in a hollow of the boulder clay; a deposit of blue silt over its floor, then a growth of peat (now about 1·5 m. thick) intermingled with the branches of trees, and finally a layer of clay burying the whole out of sight. The shellfish inhabiting the lake belonged to the Ancylus fauna and are found

fossil in the peat and silt, as also are flint implements of Maglemose type. In addition to these, two bone harpoons, more Magdalenian than Azilian in character, have been found beneath the peat.[1]

We have still much to learn about the Azilians. The greater part of Asia awaits the explorer and we look to the East for more light both on the problems of prehistory in general and in particular on the origin of the various elements which have contributed to the population both of the Old World and the New.

Evidently the close of the Glacial epoch was marked by a great movement of peoples. The ancient limits to the habitable regions of the globe had receded towards the Pole; freshly afforested areas, fresh pastures, offered ample room for expansion. Here the Azilian industry which had developed during the departure of the Ice Age under the more favourable conditions which reigned in the south might find appropriate use and spread by transmission from tribe to tribe.

If the practice of agriculture was, as we have supposed, first established at the close, or soon after the close, of the Magdalenian age in, say, the regions bordering the Mediterranean and the Persian Gulf, where some 2,000 years later the first great kingdoms of the world arose, then the presence of farming tribes, slowly but steadily encroaching on the surrounding land, as they required room for their increasing families and their crops and herds, would have supplied a *vis a tergo*, which, in the absence of any great resistance in front, would have led to that general expansion, or even migration, of the hunting tribes towards the north and east which we have already had reason to suspect.

[1] A. L. Armstrong, "Two East Yorkshire Bone Harpoons," *Man*, xxii, No. 75, 1922.

In speaking of the "Azilians" we have used this term in a very general sense to include all the races, probably very numerous, which practised some form of the Azilian industry.

The fact that the relics of this industry, previously alien to Europe, are now found scattered over nearly the whole of the Old World would of itself suggest that the area over which it spread like an infection must have been already differentiated before its approach into a great number of provinces, each inhabited by a people in special harmony with its environment.

To discover these provinces and to mark out their boundaries by a study of the implements they afford, with the assistance of an occasional human skeleton, is one of the difficult problems now engaging the attention of investigators.

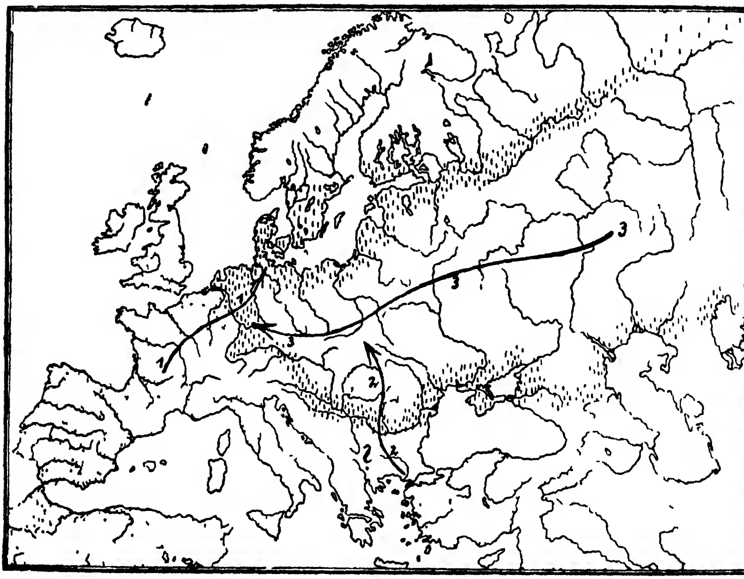
As this is a subject on which we have only very briefly touched we may take the opportunity before closing this chapter to pass in rapid review such results, and they are very meagre, as have already been attained or suggested.

Even in the Chellean age two provinces have been recognised (Fig. 356). One, which may be named Chellesia, extended from Western Europe and the shores of the Mediterranean into Asia as far at least as the Narbadda in India: it is distinguished by the characteristic Chellean boucher. The other, Trans-Chellesia, included Central Europe and thence spread out to the east and north; its northern boundary approached the Kara Sea, its southern boundary passed through the Crimea, along the Caucasus and around the northern margin of the Caspian Sea and Lake Aral.[1] Trans-

[1] H. Obermaier, "Das Paläolithikum und Epipaläolithicum," *Anthropos* xiv/xv, 1919/20, p. 146.

Chellesia is distinguished by the absence of bouchers and by the presence of a primitive industry which Obermaier terms " Proto-Mousterian."

No Acheulean provinces have as yet been defined but Obermaier Las indicated by arrows on the map



Chellesia (with bouchers).

Trans-Chellesia (without bouchers).

FIG. 356.—Arrows: 1, West Acheulean; 2, South Acheulean; 3, East Acheulean.

(Fig. 356) the course of three streams of migration by which the Acheulean industry may have entered Europe: that from the east is distinguished by peculiar forms of its boucher from the other two which come from the south, with bouchers of typical and almost identical forms.

After the Acheulean age came the Mousterian revolution when an extinct species of man, accompanied by a

warm fauna and bringing with him a new industry, invaded Europe and occupied apparently the whole of it. We might naturally look for his original home in Trans-Chellesia. Although there are indications of racial differences within the species of Mousterian man they are not associated with differences in the Mousterian culture which appears to have been on the whole remarkably uniform.

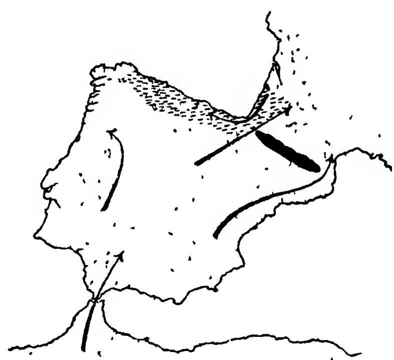
The Aurignacian revolution was no less complete than the Mousterian: it had for its result the displacement over an entire continent of one species by another and superior species of man, already differentiated into several well-marked races. This invasion coincided with a change of climate for the better [1] and thus with a time when the habitable area of Europe had greatly enlarged its bounds.

With this industry new provinces begin to make their appearance and Europe with Northern Africa and Asia Minor may be broadly divided into two regions, one to the north which may be called Gallica, since Gaul is its central part and that best studied; the other to the south, which as it borders the Mediterranean may be called Mediterranea.

In the Gallic region the Aurignacian presents its full development of Upper, Middle and Lower members, the Middle however is only intermediate by position, *i.e.* it does not form a middle term linking together the Upper and Lower in an evolutional series. It is supposed therefore to have been introduced from without as an irruption of a foreign element. It may be noted that it corresponds with the climax of a comparatively genial interregnum.

[1] This is not the Laufenschwankung, the existence of which is no longer recognised; not even, I believe, by Penck himself.

In Mediterranea this foreign element is absent and a mixture of Lower and Upper Aurignacian forms of implements produces an industry known as the Lower Capsian (Fig. 357). An African origin has been attributed to this industry which is regarded as the parent of the Aurignacian, and Obermaier represents it as streaming to the north out of Africa across the Straits of Gibraltar and through Spain into Europe, while the

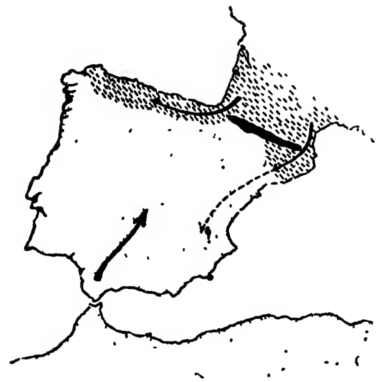


Lower Capsian (= Lower and Upper Aurignacian).
Middle Aurignacian.

FIG. 357. (After Obermaier.)

Middle Aurignacian coming in the opposite direction from France enters Spain between the Pyrenees and the Atlantic and occupies the region of Cantabria (Fig. 357). The chief difficulty in the way of this hypothesis is the Strait of Gibraltar which would seem to have opposed an impassable barrier to people who were not acquainted with boats; it is 9 miles in width where narrowest, at least 200 m. deep where shallowest, and it was already in existence at the close of the Pliocene epoch.

The succeeding Solutrean and Magdalenian stages of



Upper Capsian.

Solutreo-Magdalenian.

FIG. 358. (After Obermaier.)

Gallica are absent in Mediterranea, their place being taken by the Upper Capsian industry which consists of Aurignacian implements in process of slow transformation into the Tardenoisian by reduction in size and the assumption of geometrical forms.

The Solutrean stage as pointed out by Prof. Breuil entered Gallica from the East and it may be added contemporaneously with the oncoming of the second advance of the ice of the last Glacial episode and the consequent constriction of the habitable parts of the

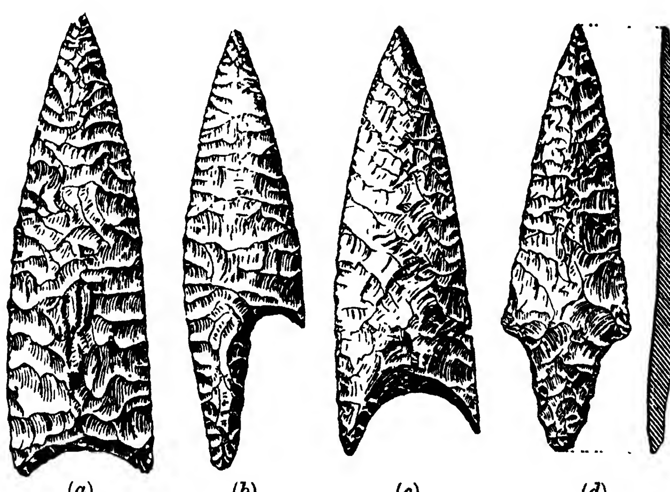


FIG. 359.—Solutrean Points. (*a*) Laurel leaf point with concave base; (*b*) Notched point of Gallican type; (*c*) and (*d*) of Catalonian type. (After Obermaier. × ⅘.)

Eurasiatic Continent. It attained the south of France and entered Spain (Fig. 358) where it developed some local modifications of the Solutrean tanged point, as in Cantabria and Catalonia (Fig. 359).

The Solutrean is the harbinger of the Magdalenian, that truly glacial industry which came in with the climax of the last great advance of the ice and persisted till just before the Glacial epoch came to an end (Gschnitz advance). It is pre-eminently the age of the reindeer when that boreal animal made its farthest advance towards the South and invaded the north of Spain.

Here, as in the Aurignacian, we are provided by the bodily remains of man with evidence of the coexistence of several distinct races of which that of Chancelade is the most suggestive, since by its affinities with the Eskimo it distinctly points to a movement of peoples from the north and east.

A distinction into industrial provinces has not yet been established, but Burkitt [1] has called attention to a marked difference in the working of flint in Perigord and the Pyrenees.

Finally we reach the Azilian, the last of the Palæolithic revolutions, with its industries concealing under a cloak of uniformity a multitude of apparently trifling diversities.

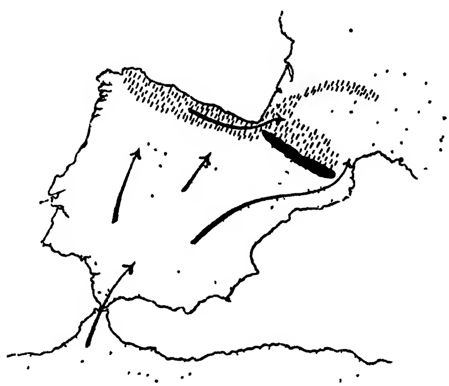
Here we have to distinguish the Azilian (*in sensu stricto*), the Final Capsian, Tardenoisian and Maglemose industries. The Final Capsian occupies a large part of Mediterranea, it can be traced to the East from Northern Africa to Egypt and Syria, and from the Iberian peninsula through Southern Italy to the Crimea. How it reached Europe is still a problem, but Obermaier brings

[1] M. C. Burkitt, *Prehistory*, p. 140.

it from Africa across the Strait of Gibraltar into Spain (Fig. 360). A movement to the west along lands north and south of the Mediterranean may however have originated in an area much farther to the east.

The Tardenoisian which occupies so large a part of Gallica is according to the same authority derived from the Final Capsian of Spain.

The Azilian also is supposed to have been developed



Final Capsian.

Azilian.

Fig. 360. (After Obermaier.)

from the same industry as it existed in the north-west of Spain and to have passed thence, west of the Pyrenees, into France and then to the north as far as the British Isles and east as far as the Rhine.

In the Maglemose industry we seem to perceive a surviving Magdalenian culture penetrated by an invading Tardenoisian influence.

The successive revolutions which we have encountered in this brief review lead us finally to reflect on the great fluctuations of climate, several times repeated,

which occurred during the Pleistocene epoch, and the far-reaching effects they must have produced in the animate world. First we see the tundra, steppe, prairie and forest, alternately contracting and expanding with the waxing and waning of the ice. Then the great herds of herbivorous animals already strictly adapted to these several environments accompany them in their oscillations towards and from the pole.

Finally the various races of mankind whose existence is equally bound up with particular floras and faunas and climatic zones swing to and fro in the same great rhythm.

In such movements we may perceive perhaps one of the conditions which have contributed to the evolution of the human species and its manifold varieties.

CHAPTER XIV

CHRONOLOGY

THE last and most difficult part of our task now awaits us, and we must endeavour to assign each of the ancient hunting stages its place on the recognised scale of time.

It would be comparatively easy to construct a consistent scheme if we could only persuade ourselves to disregard a few inconvenient facts, but in making an impartial survey we become increasingly impressed with the conflicting nature of the evidence, and end by admitting that there is much room for differences of opinion; that many of our results are open to discussion and likely to be modified with the progress of discovery.

Even the doctrine of interglacial episodes, which seemed at one time to have been firmly established, has again been seriously questioned by experienced observers.

The Hötting breccia at the time I visited it seemed to afford incontrovertible evidence in favour of this hypothesis; nothing could be clearer than the fact that the breccia rests on one boulder clay and is covered by another; this, indeed, is disputed by no one. But now we learn from Prof. R. Lepsius that the breccia is not a single undivided deposit; it is said to consist of two members, one older, distinguished by its white tint, the other more recent, reddish in colour. According to Prof. Lepsius it is the younger only which lies between the boulder clays, and it is the older only

which contains the fossil flora. To this a Pliocene age is assigned. On the whole I am not inclined to accept this explanation; it does not appear to be in accord with the facts; in the section from which he obtained his fine collection of plants Von Wettstein describes red breccia as intercalated with the white,[1] and Penck has described the white breccia as resting on the red. That the red breccia is unfossiliferous is only what its colour might lead us to expect, for the iron rust or ferric hydrate to which this colour is due is extremely destructive of organic remains. For the present, therefore, we may, I think, accept Penck's inference as sound.

It has also been urged that the Hötting breccia was not deposited upon the lower boulder clay, but was formed first. After its formation it was supposed to have been undercut by weathering or erosion, and then into the recess thus formed the boulder clay was said to have been forced under pressure. Thus the boulder clay was regarded as intrusive, younger than the breccia, and of the same age as the upper boulder clay.

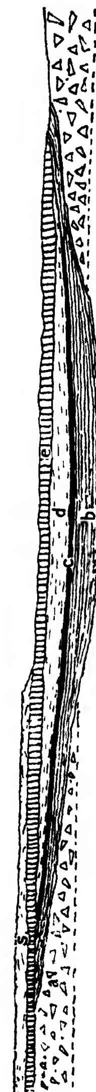
To put an end to a long controversy the Royal Prussian Academy of Sciences resolved to investigate the question by mining excavations on rather a large scale; now that these are completed we learn that the hypothetical explanation just alluded to has no basis of fact, and that the relations between the breccia and boulder clays are precisely those described by Penck already summarised here on p. 24 *et seq.* Of the existence of either the second or third genial episode there can therefore be little doubt.[2]

In this country we have long been accustomed to the

[1] R. von. Wettstein, "Die Fossile Flora der Höttinger Breccie," *Denks. d. math.-nat. cl. d. Kk. Ak. Wiss. Wien*, 1892, lix, p. 7, sep. copy.

[2] O. Ampferer, "U. d. Aufschliessung der liegende Moräne unter d. Höttinger Breccie, etc.," *Zeits. f. Gletscherkunde*, 1914, viii, p. 145 *et seq.*

belief that the men of the valley gravels belonged to an epoch much later than the chalky Boulder Clay. This was supposed to have been established by Prestwich more than half a century ago,[1] when he described the famous section at Hoxne, where John Frere had discovered Palæolithic implements in 1797.[2] They were so numerous at that time that they were sometimes used to mend an adjacent road; this is referred to by Frere, who remarks:—"The manner in which the flint implements lay would lead to the persuasion that it was a place of their manufacture and not of their accidental deposit." Prestwich asserted that the implements, which are Acheulean bouchers, occur above a series of lacustrine beds which occupy a hollow in the boulder clay; but though his observations in general have since been abundantly confirmed by the explorations of Mr. Clement Reid, made on behalf of a Committee appointed by the British Association,[3] yet on this point he seems to have been mistaken. By means of borings and trial pits Reid established the following succession (Fig. 361):—At the base is chalky Boulder Clay (*a*), resting on glacial sands; a hollow in this is filled with (*b*) lacus-



1 J. Prestwich, *op. cit. Phil. Trans.* 1869, cl, p. 305.
2 John Frere, *loc. cit.*
3 "The Relation of Palæolithic Man to the Glacial Epoch, Report of the Committee, drawn up by Clement Reid," *Rep. Brit. Assoc.*, 1896, Liverpool, pp. 400–415.

FIG. 361.—Section at Hoxne. *a*, Boulder clay; *b*, lacustrine clay; *c*, lignite; *d*, black loam with Arctic plants; *e*, loam; *s*, sand. Acheulean bouchers occur in *e* and *s*. Scale about 100 feet to 1 inch. (After Clement Reid.)

trine beds, 20 feet in thickness, (*c*) a layer of lignite with remains of a temperate flora, and (*d*) lacustrine beds 20 feet in thickness, containing an Arctic or sub-Arctic flora, characterised by the dwarf birch (*Betula nana*); then extending over all these deposits a layer of (*e*) brick-earth and (*s*) sands; but, and this is where Reid differed from Prestwich, he found that the implementiferous horizon occurs below and not above the *Betula nana* bed.

Representing this in a vertical column we have :—

Loam and sands.
Cold climate (*Betula nana*, *Salix polaris*).
Temperate climate (*Alnus glutinosa*, *Rosa canina*), Acheulean implements.
Glacial climate, chalky Boulder Clay.

There seems to be a fair amount of evidence to show that a warm Acheulean industry occurs in the Lower Monastirian stage; consequently the Glacial episode, represented here by a chalky Boulder Clay, which preceded this industry should be Upper Tyrrhenian and the Arctic plant bed which succeeded it Upper Monastirian.

Soon after the publication of Prestwich's first paper, additional evidence in support of the post-glacial age of man was produced from another famous locality, the Biddenham gravel-pits, which were visited in 1861 by Prestwich, Evans, and Lyell in company. The section given by Prestwich (Fig. 362) shows the chalky Boulder Clay on each side of the valley of the Ouse, and it is obvious that it must originally have extended in an unbroken sheet across the country. It was afterwards cut through by the Ouse as the meandering river excavated its valley, and by the time the valley floor corresponded with the upper broken line in the section the sheets of gravel seen at Biddenham were supposed

to have been deposited. Since that time the river has sunk its bed some 50 or 60 feet lower, leaving the Biddenham gravels on the top of a hill, about two miles long and three-quarters of a mile broad, and nearly encircled by a bend of the river.

The gravels have afforded plentiful remains of the warm fauna, hippopotamus, *Rhinoceros megarhinus*, *Elephas antiquus*, and the red deer, as well as the cave bear, cave hyæna, horse, auroch, and the bison. The remains of the mammoth, reindeer, and *Rhinoceros tichorhinus* are also said to occur, but may possibly

FIG. 362.—Section across the valley of the Ouse, two miles W.N.W. of Bedford. 3, Cornbrash; 2, Oxford clay; 1, boulder clay, rising to 90 feet above the Ouse; *d*, river gravel with Chellean implements, hippopotamus, and *Hydrobia marginata*; *c*, recent river gravel; *a*, recent alluvium of the Ouse. (After Prestwich.) [1]

have been obtained from a higher horizon, for it is admitted that the mammalian bones occurred at different levels. Land and fresh-water shells were not uncommon, mostly of species still found in the country, but one of them, *Hydrobia marginata*, no longer exists in England, though it still survives in the south of France.

In these gravels, which seem to correspond in position with those of the second terrace in the valley of the Somme and contain a similar warm fauna, some large

[1] C. Lyell, *The Antiquity of Man*, London, 1863, p. 164, Fig. 23, and J. Prestwich, "On the Geology of the Deposits containing Flint Implements and on the Loess," *Phil. Trans.*, 1864, cliv, p. 254. At the time Lyell wrote the great question of the day was whether man was "preglacial" or not; it remained a subject for discussion up to the end of the century; most of the leading authorities said "not."

Chellean bouchers were found; hence it was inferred that the Chellean industry is younger than the chalky Boulder Clay or the latest glacial deposit of East Anglia.

But here I think we may discern a fallacy: it lies in the assumption that the valley gravels are necessarily later than the boulder clay. The warm fauna and the Chellean bouchers indicate a Lower Tyrrhenian age and the boulder clay must therefore be either Upper Tyrrhenian or, though this is less likely, Upper Monastirian in age.

We conclude, therefore, that when the boulder clay extended across the valley, as once no doubt it did, it covered up the already existing gravels, and that subsequently both it and the gravels have been cut through by the Ouse.

The Pleistocene deposits of East Anglia, which have long been distinguished by the perplexity of the numerous problems they present, have lately proved an unexpected source of information, thanks to the illuminating researches of Mr. Reid Moir.[1]

The beds in question succeed one another in the following order:

Monastirian	Upper	Upper Boulder Clay (Mousterian).
	Lower	Middle Glacial sands (Mousterian).
Tyrrhenian	Upper	Lower Boulder Clay.
		Arctic Fresh-water bed.
		Leda myalis bed.
	Lower	Upper Fresh-water bed.
		"Forest" bed.
		Lower Fresh-water bed (Chellean).
Milazzian ?	Upper	Weybourne Crag.
	Lower	Mammaliferous Crag.
Sicilian ? ? .	. . . .	Norwich Crag.

The fundamental discovery which we owe to Mr. Moir is the presence of an ancient Chellean floor on the sea-

[1] J. Reid Moir, *The Great Flint Implements of Cromer*. Ipswich, 1923, pp. 36, 4 pls., and "On an early Chellean . . . site in the . . . 'Forest' bed at Cromer," *Journ. R. Anthr. Inst.*, 1921, vol. lii, p. 385.

coast at Cromer. The implements are exposed on the beach between tides, and have evidently been derived from the Lower Fresh-water bed which underlies the "Forest" bed series. They include flakes of various kinds, hammer stones and boldly flaked Chellean bouchers, some of which are truly gigantic; one of them weighs a little over $2\frac{1}{2}$ kgms. ($4\frac{1}{2}$ lbs.). All present a well-marked patina with ochreous yellow staining.[1]

The chief importance of this discovery lies in the help it affords in the classification of the Pleistocene deposits of East Anglia. We have seen already that the Chellean industry belongs to the Lower Tyrrhenian age, and to this age we may therefore attribute the "Forest" bed series. Such a correlation is confirmed by the contemporary mammalian fauna, for it includes a preponderant number of "warm" species, such as *Elephas meridionalis*, *E. antiquus*, *Rhinoceros etruscus*, *R. megarhinus*, and hippopotamus. Rare examples of the mammoth and one of the musk ox are known, but considering that glacial deposits lie immediately above and below the "Forest" bed series, this is not to be wondered at.

The Weybourne Crag which immediately underlies the "Forest" bed contains a boreal molluscan fauna which, as Harmer suggested, may point to an opening up of communication with the North Sea and the Baltic. It may perhaps be fairly referred to the second Glacial episode (Upper Milazzian).

The mammaliferous crag is distinguished by a warm mammalian fauna (*Mastodon arvernensis*,[2] *E. antiquus*,

[1] In previous editions of this work (p. 66, Fig. 27, 2nd ed.) reference was made to some asserted eoliths found by Mr. W. J. L. Abbot in the Cromer "Forest" bed at East Runton, one of which was admitted by Sir John Evans to be probably an implement. We now recognise the justness of this opinion, since the supposed eolith was obtained from the Chellean horizon discovered by Mr. Moir.

[2] Prof. Boswell is inclined to regard this as a divided fossil.

and hippopotamus). This is strongly suggestive of a Lower Milazzian age.

To complete this argument consistently we should refer the Norwich Crag to the Sicilian, and with the Norwich we might associate the Red Crag with its scratched flints. But our proceedings have already been sufficiently audacious and we hesitate at further depletion of the Pliocene system.

The "Forest" bed series is succeeded above by the marine *Leda myalis* bed with an Antarctic molluscan fauna, the Arctic fresh-water bed and the Lower Boulder Clay, which indicate collectively a Glacial episode following upon the warm Lower Tyrrhenian; they are evidently, therefore, of Upper Tyrrhenian age.

After the deposition of the Lower Boulder Clay the ice retreated to the north, the land rose above the sea and the rivers responded by deepening their channels; most of the East Anglian valleys were hollowed out at this time.[1]

Next followed a submergence accompanied by an abundant deposition of sands and gravels which filled up the valleys and extended beyond their borders over the surrounding land.

These are the "Middle Glacial Sands"; they point to a genial climate and have yielded to the researches of Mr. Reid Moir implements of the Lower Mousterian industry.[2]

[1] P. G. H. Boswell, "The Age of the Suffolk Valleys," *Quart. Journ. Geol. Soc.*, lxix, 1913, p. 581. *Ibid.*, "Occurrence of North Sea Drift . . . in Suffolk," *Proc. Geol. Assoc.*, 1913, xxv, p. 121.

[2] J. Reid Moir, "On the Occurrence of Flint Implements beneath the Upper Boulder Clay," *Proc. Prehist. Soc. E. Anglia*, i, 307–319.

A fine example of an Acheulean boucher is also recorded from this horizon. M. C. Burkitt, *Prehistory*, Cambridge, 1921, p. 51.

In justice to the memory of the late S. B. Skertchly it should be recalled that he had discovered and called attention to the presence of flint implements of Mousterian age in the Middle Glacial Sands nearly half a century ago ("The Geology of the Fenland," *Mem. Geol. Surv. of Great Britain*, 1878). His discovery was generally discredited, but is now seen to have been genuine.

But, as we have already seen, the Lower Mousterian industry is first met with in the Lower Monastirian of the Somme, and it is to this age, therefore, that we may refer the "Middle Glacial Sands."

The Upper or Chalky Boulder Clay which succeeds these deposits is the result of a renewed and final advance of the ice, and is therefore of Upper Monastirian age, a conclusion which finds its confirmation in the discovery by Mr. Reid Moir of Mousterian implements included in this clay.[1] From this it follows that the last glaciation of East Anglia corresponds with the last glaciation of Northern Europe;[2] that which in the Alpine region, according to the most recent investigations,[3] was the severest glaciation of all, meriting more than any which preceded it the exclusive title of "The Great Ice Age." In North Germany, however, it would appear from the observations of Soergel that the Scandinavian ice advanced during the third glaciation a little farther south than during the fourth, but this does not involve the conclusion that it did so in the British Isles.

We are indebted for our knowledge of the Pleistocene history of the south-east of England to the valuable analysis recently published by Dr. Palmer and Lt.-Col.

[1] J. Reid Moir, *Journ. R. Anthr. Inst.*, 1920, vol. i, p. 135. For confirmation of this discovery see "Excavations at High Lodge, Mildenhall," 1920; "Report on the Geology," by J. E. Marr; "Description of the [Implements]," by J. Reid Moir; "Summary of Previous Finds," by R. A. Smith: *Proc. Prehist. Soc. East Anglia*, 1920–21, iii, p. 353.

[2] Mr. M. C. Burkitt had arrived at this conclusion some years ago; he correlates the Lower Boulder Clay with the third Glacial episode and the Upper Boulder Clay with the fourth (*Man and Prehistory*, p. 58).

[3] Soergel, *op. cit.* Penck was of opinion that the maximum glaciation was reached in Switzerland during the third glaciation; Depéret, judging from the moraines of the Rhône valley, places it in the second, and Soergel, as we have stated, in the fourth. Harmer had long ago arrived at the conclusion that the Chalky Boulder Clay represents the climax of the Glacial epoch in the east of England (F. W. Harmer, *Geologists' Assoc. Jubilee Volume*, 1909, p. 103).

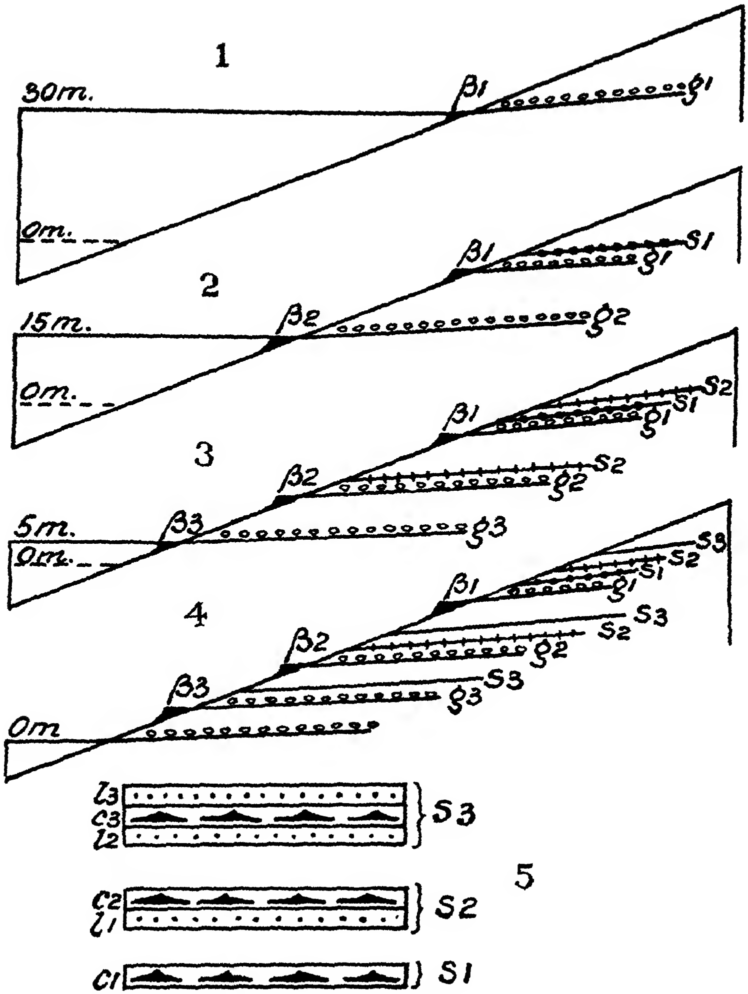


FIG. 363.—Pleistocene deposits in Hampshire. 1. First stage, formation of raised beach (β_1) and river terrace (g_1). 2. Second stage, formation of raised beach (β_2) and river terrace (g_2); also of superficial sheet (s_1) on the first terrace (g_1). 3. Third stage, formation of raised beach (β_3) and river terrace (g_3); also of superficial sheet (s_2) on the first and second terraces. 4. Fourth stage, formation of present beach and river gravels; also of superficial sheet (s_3) on all three terraces. 5. Composition of the successive superficial sheets: s_1 of coombe rock (c_1); s_2 of löss (l_1) and coombe rock (c_2); s_3 of löss (l_2), coombe rock (c_3) and löss (l_3).

Cooke.[1] The results are summarised in the accompanying diagram (Fig. 363).

Three terraces at the several heights of 30 m., 15 m. and 5 m. accompany the rivers of this district; each is associated at its termination with a raised beach (β_1, β_2, β_3) at a corresponding height above the sea.

The bottom gravels (g_1) of the 30 m. terrace and beach contain a warm fauna, with implements which are not, as we might expect, Chellean but Acheulean.

Chellean implements do indeed occur in the 30 m. terrace, but they are said to be invariably abraded, and are therefore to be regarded as derivative from an older formation (Lower Tyrrhenian).

The deposits of the succeeding beach (β_2) contain a cold fauna and Mousterian implements (Upper Monastirian), but the fluviatile gravels (g_2) of the corresponding terrace, which have afforded no fauna, are said to contain Acheulean implements.

While the river was cutting its way down from the 30 m. to the 15 m. level, a superficial deposit (s_1) of coombe rock (c_1) (*i.e.* a sludge of chalk or clay containing pebbles or broken flints) was forming on the gravels of the first-formed terrace (g_1).

A further rise of the land led to the formation of the 5 m. terrace and beach (β_3): this beach also contains a cold fauna associated with Mousterian implements, and in addition glacial erratics. Again, as the river was deepening its valley, a superficial sheet (s_2) consisting of brick-earth (l_1) and coombe rock (c_2) was accumulating on the 30 m. and at the same time on the 15 m. terrace.

Finally, as the river and sea descended to their present

[1] L. S. Palmer and J. H. Cooke, "The Pleistocene Deposits of the Portsmouth District," *Proc. Geol. Assoc.*, 1923, xxxiv, Pt. 4. I am indebted to the authors for an unpaged proof of this paper, which is now passing through the press.

level, a third sheet of superficial deposits (s_3), consisting of brick-earth (l_2), coombe rock (c_3) and brick-earth (l_3) was deposited on all three terraces.

A cold fauna distinguishes these superficial deposits throughout, and the succession of Upper Palæolithic industries includes the Mousterian in l_2 of the lower terrace, Aurignacian in c_3 and l_3 of the same terrace, and perhaps the Magdalenian in l_3 of the upper terrace. Thus the successive deposits of coombe rock and brick-earth evidently correspond as a whole to the ergeron of the Somme, *i.e.* the younger löss; the older löss being wholly absent.

The "warm" Acheulean is therefore as directly succeeded by the cold Mousterian in the superficial deposits above as by the cold Mousterian of the raised beach (β_2) below it, and consequently finds its most natural place in the Lower Monastirian. That an Acheulean horizon exists which can be referred to this age has already been indicated by M. Boule's observations on Conliège (p. 652) and Mr. Burkitt's identification of an Acheulean boucher in the Middle Glacial Sands of East Anglia.

The case is apparently simple, the evidence consistent and the conclusion of great importance, for it reveals a serious difficulty.

The older löss at Achenheim (Upper Tyrrhenian) has furnished a boucher which has been assigned to the Upper Acheulean industry (p. 652), while at least one of the implements found in the Lower Monastirian of the Portland district has been identified by Mr. Burkitt as Middle Acheulean. Thus we arrive at this singular inversion:

Lower Monastirian . .	Middle Acheulean,
Upper Tyrrhenian . .	Upper Acheulean,

i.e. a later preceding an earlier industry. This contradiction must await an explanation which when found will prove possibly both illuminating and surprising.

In the next place it may be remarked that the Acheulean is evidently closely connected with the Chellean industry, and both are associated with a warm fauna. Can it be possible that both should be placed in the Monastirian age?

If the find at Achenheim has really the importance that it seems to possess—and it is confirmed by the observations at St. Acheul—we must reply in the negative, but the necessity for further investigation is clearly imperative. Here we see how much depends on Mr. Moir's discovery at Cromer.

In the Portland district the presence of abraded Chellean implements involves the existence in the higher terraces of the gravels from which they have been derived. A search for these might provide interesting results.

Finally, the unexpected occurrence of the Acheulean instead of the Chellean industry at the base of the 30 m. terrace cannot be passed over without comment. It is true that in the Cromer district we have already recorded the presence of the Chellean industry at just above sea-level, but while this shows that we cannot trust implicitly to inferences drawn from altitude alone, it is at the same time intelligible as the result of the very different conditions which are known to have prevailed in that region.

The terraces south of the Weald, on the other hand, are harmoniously graded with those on the north, and this would naturally lead us to expect a corresponding succession of industries. Though this expectation is disappointed, yet the anomaly is not so great as it

might appear, for it has been shown by Mr. H. Dewey that the 30 m. terrace of the Thames at Swanscombe includes a conformable series of gravels with a normal succession of Lower Palæolithic industries, beginning in the Barnfield pit with the pre-Chellean in the lower gravel, and passing up into late Chellean in the middle gravel, to be followed in an adjacent exposure by the Acheulean which occurs at the top of the middle gravels, and completes the series. Thus the deposits at the base of the 30 m. terrace in the Portland district are on the same horizon as those at the summit of the 30 m. terrace at Swanscombe.

Let us now turn to the west of our island, and first to those caves of North Wales (Cae Gwyn) which provided some years ago materials for a lively controversy.[1] They contain flint implements, discovered by the late Dr. Hicks, which are shown by their position to be older than the glacial drift found in close association with them. This, however, is a fact which ran counter to the prejudices of a time when the existence of pre-glacial man was strenuously denied and attempts were therefore made to explain it away. The most telling objection was raised by Sir John Evans, who pointed out that the implements are of Upper Palæolithic age, and therefore it was assumed post-glacial.

We now know that this is an argument of no weight: Dr. Holst has identified the implements as Aurignacian; they mark, therefore, that period in the recession of the ice which occurred between the first and second stages of the last glaciation. The associated glacial drift itself must be referred to the second of these stages.

Further, as I am informed by Miss Garrod, Proto-Solutrean implements form a part of the industry found

[1] J. E. Marr, Presidential Address, *Proc. Prehist. Soc. East Anglia*, 1920, iii, p. 179.

in the Cae Gwyn caves. These mark the renewed advance of the ice which took place immediately after the Aurignacian age, and at the same time the final occupation of the cave by man, for the Magdalenian industry is wholly absent.

In South Wales the most completely investigated cave is that of Paviland, Pembrokeshire. The predominant industry there is Aurignacian,[1] and so far all that we have said of the horizon of the Cae Gwyn caves applies to it; but it also contains Upper Mousterian implements. The fauna is that of the reindeer, with a complete absence of " warm " species. All the evidence suggests that the cave was continuously occupied from the close of the Mousterian to the beginning of the Solutrean age, which is represented by Proto-Solutrean implements, *i.e.* throughout the whole of the milder interval which occurred in the middle of the last Glacial episode.

In some adjacent caves of Gower a lower layer containing remains of a " warm " fauna occurs below the level of the reindeer fauna. This is probably Lower Monastirian. As in the Cae Gwyn caves, so in Paviland, the Magdalenian industry, which indeed is but poorly represented anywhere in the British Isles, is completely absent. This tempts us to inquire whether the maximum glaciation of the British Isles may not have corresponded with the second advance of the ice at the close of the Monastirian age.

Let us now return to the Continent.

In the first place we may call attention to some observations by Prof. Boule,[2] who points out that Acheulean bouchers occur overlying the moraines of the third Glacial episode, but not those of the fourth.

[1] This is also true of Kent's Hole, Torquay.

[2] M. Boule, " Observations sur un Silex taillé du Jura et sur la Chronologie de M. Penck," *L'Anthropologie*, 1908, xix, p. 1.

He cites the fact that M. Tardy found one of these bouchers on the right bank of the Ain, above the alluvium which overlies the undisturbed moraine of the great Rhône glacier, and that in 1908 M. Lebrun found another near Conliège,[1] five kilometres south-east of Lons de Saunier (Jura), *i.e.* in a region occupied by the ice during its greatest extension, or in the third Glacial episode.

From these observations[2] we may infer that the Acheulean is in part later than the third Glacial episode, since Acheulean implements rest on the moraine of this period, and this is a conclusion completely in harmony with that suggested by our study of the Hoxne section.

In the valley of the Somme, as we have also learnt, the lower löss contains an Acheulean industry, the upper löss the cold Mousterian, Aurignacian and Solutrean industries. In the valley of the Rhine a section at Achenheim,[3] which lies about nine kilometres west of Strassburg on the eastern slope of the Vosges, reveals the following:

	a. Soil, Neolithic.
Upper Löss.	*b.* Löss weathered into loam above.
	c. Löss weathered into loam above. In the loam Upper Aurignacian implements and traces of hearths; near the base of the loss, first bones of small mammals and then the chief bone layer; at the base, Mousterian implements and hearths.
Lower Löss.	*d.* Löss weathered into loam above. In the löss an Upper Acheulean boucher.
	e. Löss weathered into loam above. In the loam hearths and rudely worked flints.
	f. Löss weathered into loam above. At the base a rude flint scraper and bones of reindeer.
	g. Red fluviatile sands.

[1] See map, Fig. 68.

[2] It should, however, be pointed out that the observations of M. Tardy are open to criticism; *v.* Mayet and Pissot, "La Columbière," *Ann. de L'Univ. de Lyon*, 1915, ser. i, vol. 39, p. 15 *et seq.*

[3] E. Schumacher, "Bemerkungen ü. d. Fauna d. Löss von Achenheim, etc.," *Ber. d. Direktion d. geol. Landesanstalt von Elsass-Lothringen*, 1911, vii, pp. 323–344.

The chief bone layer of the upper löss has here afforded evidence of the mammoth, reindeer, *Rhinoceros tichorhinus*, and the bison; the smaller mammals found just above it are the suslick (*Spermophilus rufescens*) and the marmot (*Arctomys primæva*). This is the cold fauna. The fauna of the lower löss is also a cold fauna; it includes the reindeer, mammoth, suslick, marmot, and bobac, but also, strangely enough, *Rhinoceros Mercki*,[1] a species of the warm fauna. This must be a relic of the genial climate which intervened between the formation of the two lösses. It probably left its bones on the surface as the genial climate approached its end. This is suggested by the fact that the bones occur in the loam of the ancient löss, and if they had been present in the löss before it was converted into loam they would almost certainly have been destroyed by weathering.[2]

The succession at Achenheim thus agrees in its main features with that at St. Acheul; in both the Acheulean occurs in the lower löss, the Mousterian and Aurignacian in the upper; in both the upper löss contains a characteristically cold fauna; but at St. Acheul the lower löss contains few if any fossils. Commont, on the evidence of a sandy loam near its base, has attributed to it a warm fauna. The sandy loam, however, does not appear to form part of the löss: it is said to be a fluviatile deposit.

The discovery by Commont of the Mousterian with a warm fauna on about the horizon of the Acheulean in the valley of the Somme has led us to assign this industry in part to the Lower Monastirian age, and thus relieved us of the difficulty once presented by the cave of Wild-

[1] This species is nowhere else associated with the reindeer, and doubts have been expressed both as to its identification and its position in the löss.

[2] Soergel, *op. cit.*, p. 35.

kirchli on the Säntis.[1] This cave opens on the side of the Ebenalp (1,684 m. = 5,526 ft.) at a height of 1,500 m. (5,005 ft.); it contains Mousterian implements mingled with bones of the cave bear, cave lion, cave leopard, wolf, ibex, chamois, and stag. The reindeer is absent, and the fauna may as fairly be called "warm" as "cold." The bones of the cave bear are especially numerous; according to Herr Bächler they must represent about 1,000 individuals. Evidently this was a favourite hunting-place, with abundant game and forests near at hand. Not, however, during a glacial episode, when the Ebenalp was surrounded by a sea of ice and probably covered with "eternal" snow; a genial climate, as Prof. Penck contends, seems much more probable. But, as we have seen, the "cold" Mousterian of the löss is followed by a regular series of later industries up to the close of the Glacial epoch, and thus the only place left for a "warm" Mousterian is in the Lower Monastirian age.

We are now prepared for the consideration of another important question. Is it possible to assign to any of the Palæolithic stages a date in terms of years?

The earlier attempts to answer this question were based on the thickness of sediment which has been deposited in quiet waters since the epoch to be determined. But this method is vitiated by the fact that it does not take into account—and, indeed, has no means of estimating—the effect of past climatic changes, such as we know to have occurred, on the rate of deposit. The results obtained by it may be valuable as indicating a maximum, or as giving us some notion of the order of magnitude of the periods with which we are concerned, but beyond this they are of little value. Thus Nuesch

[1] E. Bächler, "Die prähistorische Kulturstätte in der Wildkirchli-Ebenalphöhle," *Verh. d. Schweizer Naturf. Ges. in St. Gallen*, 1906, and Penck and Brückner, *loc. cit.*

has estimated the age of a temporary arrest in the retreat of the ice of the last Glacial epoch, Penck's Buhl stage, at 24,000 years; while its more probable value is about half this period. A. Heim, however, made a much closer approach to the truth. Basing his estimate on the present rate of growth of the little delta now being deposited in the Lake of Lucerne by the Muotta, he concluded that the complete retreat of the ice was accomplished in 16,000 years. Penck, however, argues that this result does not apply to the complete retreat, but only to that portion of it which followed his Buhl stage. If this should prove to be the case, then we may be fairly certain that the estimate is in excess.

The more exact method to which we look for the ultimate solution of this problem is that devised by Baron de Geer;[1] space will not permit us to explain this in detail, but the principle is simple enough; it consists in actually counting the number of annual layers of sediment which the melting ice deposited in the sea during its retreat.

That it is possible to make an accurate count is due to the sharpness with which the successive layers are defined, and this is owing to a seasonal change in the nature of the sediment; during summer, when the ice was rapidly melting, a comparatively thick layer of fine sandy material or silt was deposited; this was followed in winter by a thin layer of clay much darker in colour and finer in texture.

De Geer has so far succeeded in counting the number of layers which cover the south of Sweden from Estof in Scania to a point near the watershed where the ice had almost entirely dwindled away; their number is 5,000,

[1] Gerald de Geer, "Geochronology of the last 12,000 Years," *Congress. Geol. Internat. C. R.*, xi, 1910 pp. 241–253.

and this, therefore, is the number of years which elapsed during the recession of the ice in Southern Sweden.

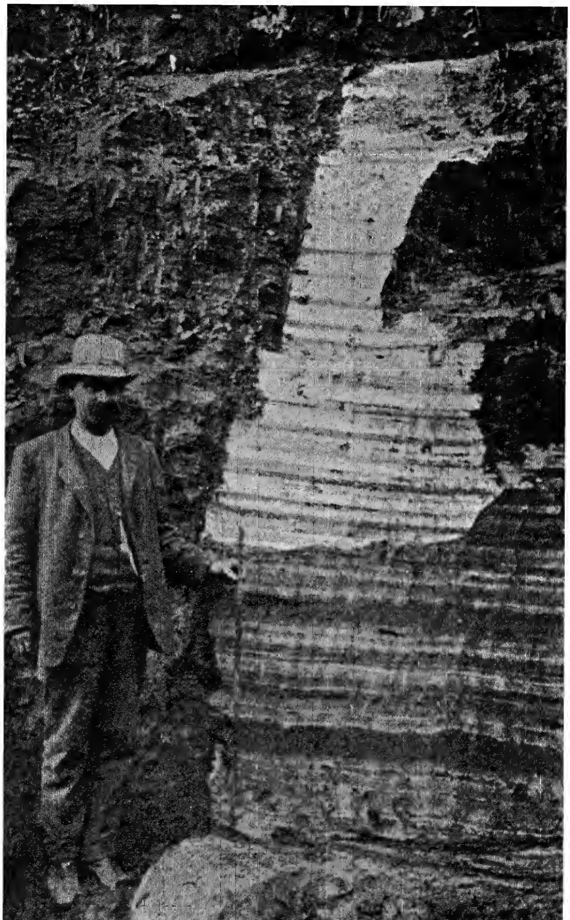


FIG. 364.—Banded clay, Finland. (After Sederholme.)

Of course these layers were not all counted at any one place; but sections through the layered sediment, or banded clay (Fig. 364) as it is termed, were obtained at a series of points taken along the line of retreat of

the ice. Each section exposed a succession of bands or layers, and by piecing the several sections together the complete succession was obtained.

The great difficulty was to discover a means of identifying the several beds, for they are not distinguished by dots and dashes as in the diagram (Fig. 365). It was found that different bands differ in thickness, the result, no doubt, of annual differences of temperature—such as occur at the present day—

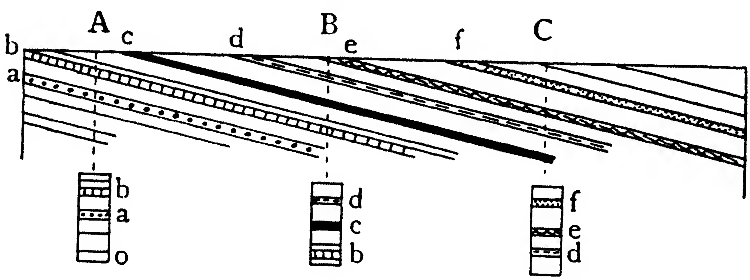


FIG. 365.—Diagram to show how sections may be pieced together. The inclination of the layers is very much exaggerated. Starting from *o* in section A, we can count the layers up to *b*; in section B we add the number from *b* to *d*, and in section C, from *d* to *f*.

which produced annual differences in the amount of ice melted away and consequently in the amount of mud deposited in the sea.[1] It was on this fact de Geer based his method.

To trust to the unusual thickness of any single band as a means of identification would be hazardous in the extreme, but when a series of periodic differences presented by the layers in one section is repeated at the next, we are on surer ground, and may proceed to our identification with confidence.

The accompanying illustration (Fig. 366) shows how de Geer has applied this method.

[1] It should be pointed out that the ice sheet extended into the sea, which at that time stood higher than it does now.

It will be seen from this explanation that de Geer has provided us, not only with a method for measuring the rate of recession of the ice, but with a meteorological table recording the annual changes of heat

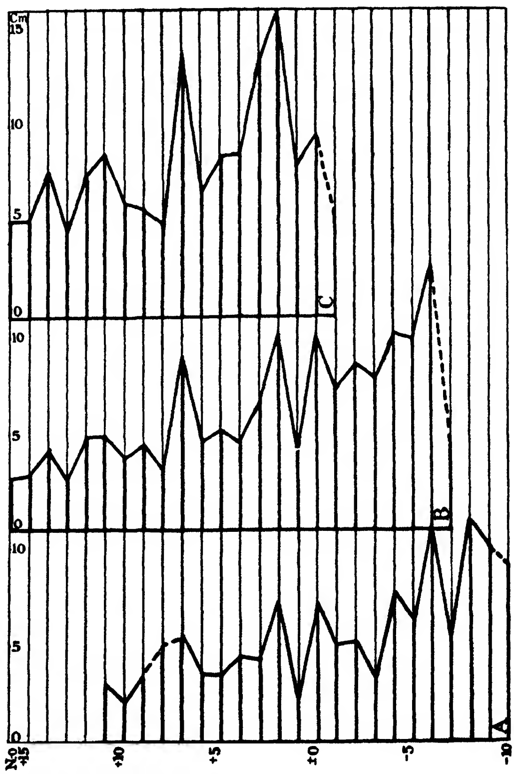


FIG. 366.—The thickness of the layers is indicated by the thick horizontal lines. The lines joining their extremities indicate at a glance the periodic variation.

receipt over several thousands of years. We are far from reaping as yet all the valuable results which are destined to grow out of this remarkable investigation.[1]

[1] In the year 1920 de Geer visited America, and succeeded, with the assistance of Antevs and Sauramo, in obtaining a record for the interval of 1556 B.C. to A.D. 297. It revealed a surprising correspondence in the thickness of the layers for the same years in Sweden and America; no less

We have found that 5,000 years elapsed during the recession of the ice over Southern Sweden; but how many years have elapsed since its retreat came to an end?

By counting the layers of mud which have been deposited in the lake of Ragunda [1] since it was first uncovered by the ice when this reached the limit of its retreat, Baron de Geer has been able to answer this question. A close approximation is 7,000 years, and recently this has been rendered more exact by observations undertaken by Lidén [1] on the banded clay in the valley of the Ångermanälo. These give a period of 8,500 years. If now we add to this the 5,000 years consumed by the ice in its retreat over Southern Sweden, we obtain 13,500 as the number of years which separates our time from that when the receding front of the ice had already retired as far as Estof in Scania.

But, as we have already seen, the margin of the ancient ice lay far beyond the limits of Scandinavia (Fig. 6); at one time it extended due south of Scania to a little beyond Dresden. This, however, was during the third Glacial episode; during the last or fourth, with which alone we are now concerned, its boundary, according to Brøgger, crossed Jutland and the Baltic provinces, being marked by a terminal moraine known as the Baltic ridge.[2] The distance between this and the southern coast of Scania is about half that which the

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than from 74 to 89 per cent. are in agreement. (G. de Geer, "Correlation of the late Glacial annual clay-varves (layers) in North America with the Swedish time scale," *Geol. Föreningens*, vol. xliii, 1921, pp. 70–73; but see also E. A. Antevs, "The Recession of the last Ice Sheet in New England," *Amer. Geogr. Soc. Research Series*, No. 11, 1922.)

[1] By good fortune the lake had been drained, and thus its deposits were accessible to observation.

[2] Its extreme limit is now supposed to have lain south of Magdeburg and Sorau.

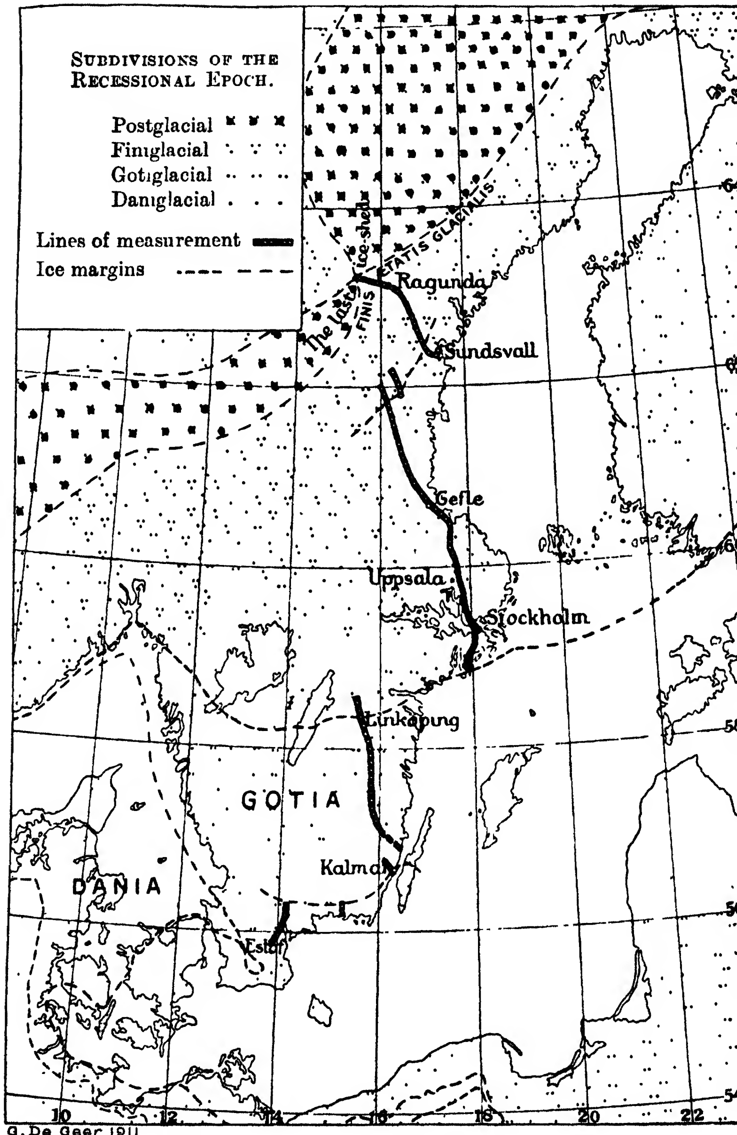

FIG. 367.—Stages in the retreat of the ice of the last Glacial episode. The thick black lines dotted white represent the lines along which de Geer counted the layers of the banded clay. It will be seen that the duration of the Dani-glacial retreat has not yet been measured. (After de Geer.)

ice traversed in its retreat over Sweden, and it is necessary, therefore, to know how long the ice took in withdrawing from this region (Dani-glacial retreat, Fig. 367) if we are to determine the true value of the whole period of retreat. Here, unfortunately, our data fail us; de Geer's method has not yet been applied to Jutland or the Baltic provinces, and all that we can do is to make a more or less plausible guess. It might be supposed that if the ice took 5,000 years to accomplish its retreat over Sweden it would only require half that time for a distance half as great. But this assumes that the rate of retreat was uniform, while we already know from de Geer's observations that it was very far from being so; in the neighbourhood of Stockholm it was five times as fast as in southern Scania, and north of Stockholm it was even faster. Perhaps we shall not be far from the truth if we assign a period of 5,000 instead of 2,500 years for this part of the retreat, but this, it may be well to repeat, is nothing more than a guess. Accepting it provisionally, we arrive at a total of 10,000 years for the full period of retreat, or of 17,000 years for the interval which separates our time from the beginning of the end of the last Glacial episode.

This estimate appeared in our last edition (1915); since then a number of distinguished Scandinavian geologists [1] have zealously aided in the great work of constructing a chronological scale for the latest ice age and its palæolithic industries. How the question stands at present will be most readily understood from the

[1] R. Lidén, "Geokronologiska studier öfver det finiglaciala skedet i Ångermanland," *Sveriges Geol. Undersökning*, Ser. Ca. No. 9, p. 28. Matti Sauramo, "Geochronologische Studien über die Spätglaziale Zeit in Sudfinnland," *Bull. Com. Géol. de Finlande*, No. 50, 1918, pp. 1–44, 4 pls. *ibid.*, "Studies on the Quaternary Varve Sediments in Southern Finland," *op. cit.* No. 60, 1923, pp. 1–164, 1 map, 10 pls.

following account taken from a communication[1] with which I have been favoured by the kindness of Prof. de Geer. The letter is dated 3rd November, 1923.

"The determination by Lidén of the post-glacial sub-epoch as 8,500 years is no doubt correct. Its connexion with our own times is open to a possible error of perhaps a single century.

"The precise limit between the post-glacial and Finiglacial sub-epoch lies a little farther back than 8,500 years in my chronology, but this does not affect the accuracy of Lidén's measurements.

"As to the time occupied by the retreat of the ice across Sweden from Estof to its last resting-place, it was found in 1900 to amount to 12,000 years, but now such a mass of fresh data has been obtained that I hope it will be possible to date not only the commencement of the Gothi-glacial sub-epoch but of the Dani-glacial as well, and thus to determine the whole time which has elapsed since the maximum[2] of the last glaciation.

"Yet as the necessary revision of the mass of new measurements is still incomplete, no trustworthy figures can at present be given. At most the guess may be ventured that the commencement of the Gothi-glacial sub-epoch may be found to lie some fifteen to sixteen thousand years beyond the present day.

"Concerning estimates of time for the earlier parts of the Pleistocene epoch, they seem to be so very conjectural and untrustworthy that they ought not to be given in terms of years at all, or in any case not in the same way as the results of actual measurements. It is possible that attempts may be made to extend actual time measurements over the whole of the Pleistocene epoch, and, if

[1] This should be read in conjunction with the map (Fig. 367).
[2] *I. e.* to the Baltic moraine.

so, I fear that the result will be a hecatomb of erroneous dates.

"All dates based upon supposed eustatic, late Pleistocene movements of the surface of the sea must be erroneous, because the changes of level in Scandinavia—studied in very great detail for the past three decades by many accomplished specialists and described in a comprehensive literature—have shown that those changes of level which have been thoroughly investigated are with certainty the result of movements in the earth's crust, and that no place is left for negative eustatic movements of the sea."

It will be seen from the diagrams (Fig. 353) that the Ancylus lake was in existence at a time when the ice had very nearly, though not quite, accomplished its full retreat; *i.e.* a little more than 7,000 years ago (the length of post-glacial time); and Baron de Geer, although he has not yet been able to bring the beach of the lake into connexion with his system of measurements, thinks—as he has kindly informed me—that its probable date may be 7,500 years, counting from the present.[1]

This corresponds very closely with the date assigned in the first edition of this work to the Azilian age—which was contemporary with the lake—and is as near an approximation as we can hope to reach to the age of the last of the ancient hunting races.

For their predecessors no dates can as yet be safely assigned, and to venture upon speculation in this matter would in all likelihood be merely to add to the "hecatomb of errors" which de Geer so clearly foresees.

Let us now cast a brief retrospective glance over the history of mankind, beginning with this present year of grace.

[1] This was written in 1915; Lidén's measurements would slightly increase this estimate.

Before we have journeyed backwards 500 years we have already left behind us the age of coal and the immense wealth of energy it supplies, and reached the reign of Queen Elizabeth, when, ignorant of the potency of coal, the people of these islands produced great men, and did mighty deeds; 1,000 years, and we have passed the whole history of England since the Norman Conquest; another thousand takes us to the birth of Christ: as we approach the third millennium we leave behind the beauty that was Greece, the glory that was Rome, and find ourselves under the dominion of the great kingdoms of Egypt and Assyria. So far the age of iron extends, but very soon we enter a time when iron was unknown and men made their weapons and implements of bronze; as we leave the fourth millennium this also disappears, and copper takes its place; a little farther, as we approach the fifth, even this has gone; there are no more metals, and all man's handiwork is in bone and wood and stone. A little farther, and all the Egyptian dynasties are left behind, there are no longer any great cities, nothing but little villages, built, many of them, on wooden piles in the shallows of some lake. Still, through the whole of this long journey, down to the sixth millennium, the basis of society has always remained the same—the farmer who tills the soil and the shepherd who tends his flocks; but now as we pass the seventh millennium we lose this also, and man depends for his subsistence on the natural products of the soil, the roots and fruits, which it is the especial duty of the women to collect, and occasional fish and meat which are contributed by the men. We are in the hunting age!

The climate preserves a remarkable uniformity throughout historic time, but grows a little warmer, as

much as 2° C. in temperate regions, as we approach the Neolithic age, then it begins to deteriorate, and when we reach the Azilians we look across the great depression of the last Glacial episode. The snow-line descends the mountain sides and at last lies more than 1,200 metres nearer the sea level than it does to-day. In more favoured lands man survived this inhospitable climate along with its cold fauna. Earlier still, when the snow had withdrawn to gather itself once more about the mountain heights and a warm fauna had replaced the cold, we again meet with him, but changed; he is armed not only with weapons of his own invention, but with the formidable teeth that were among the last vestiges of his inheritance from the ape.

If there is one fact in all this story that stands out more salient than the rest it is the progressive nature of the human race. This is most immediately obvious in the practical arts of life; every successive stage brings with it some improvement in methods, some new power over material.

Still more remarkable is the wonderful unfolding of the inner life. Even at a comparatively early stage man is found expressing his sympathy with the living world around him in works of art, many of them astonishing in their absence of convention and their faithful rendering of beautiful forms. The bits of life which the artist has felt, which have fastened on his memory, and which he delights to recall with brush or burin—the boar making its fierce charge, the mare tending her playful colt, the reindeer grazing by a quiet pool—these also appeal to us. We look across the ages and we recognise in these hunters a reflection of ourselves.

In addition we discover the sympathy of man for

man. We stand by the open grave and look upon the last gifts which the mourners in an innocent superstition have provided for the spirit's adventurous journey in another world. Here we are made aware of a faith in the unknown and the quickening of immortal hopes.

Thus all through the dimly discerned history of ancestral man the facts bear witness to the unfolding of a progressive being.

But the primitive hunter, who already entertained the expectation of another life, was endowed with a brain which still retained many of the original characters of the ape. The brain of modern man has been purified of these.

If this be so, then it would seem probable that the progress recorded by the works of man's hand was accompanied by modifications in the structure of his brain.

Here we are face to face with that mystery of mysteries, the problem of evolution, for which no ingenuity, however great, has yet furnished a solution. Natural selection, that idol of the Victorian era, may accomplish much, but it creates nothing.

In the matters of invention, discovery, the attainment of skill, we have some experience of the inner nature of the process; it involves the mind, with its powers of observation, reflection, and imagination, and it is accompanied by a sense of effort. When the effort is slight and the result appears disproportionately great, we speak of it as inspiration, and this is another mystery.

If these experiences within ourselves correspond with a progressive modification of the substance of the brain, then it would seem possible that the fundamental cause in the whole process of evolution is in reality an affair of the mind.

We know very little of the powers of the mind, on this subject we are scarcely more advanced than were the ancient hunters in their knowledge of the latent potency of matter.

The material universe man has already subjected in no small degree to his sway; he is master of the earth,—the sea,—the air. Yet there still remains a world to conquer; it is the world within. Here is room for great adventure. Here man's noblest triumphs still await him, and when all our coal has passed away and our material civilisation along with it, he may discover a new heaven and a new earth in the conquest of that greatest mystery of all—himself.

Chronological Table

	Age.	W. Europe.	C. Europe.	Industry and Hominidæ.
Monastirian	Upper	La Madeleine Chancelade Bruniquel Laugerie Basse Placard	Schweizerbild Kesslerloch Andermach Schussenried Sirgenstein	Magdalenian *Homo sapiens*
		Solutré Lacave Placard Trilobite	Sirgenstein Předmost	Solutrean
		Aurignac Font Robert La Gravette Chatelperron La Ferrassie L'Abri Audi	Metternich Krems Achenheim Willendorf Sirgenstein	Aurignacian *H. sapiens*
		Le Moustier La Quina La Chapelle	Sirgenstein Karstein Achenheim.	Mousterian II *H. Neandertalensis*
	Lower	St. Acheul La Micoque Laussel La Ferrassie Grimaldi	Taubach Ehringsdorf Krapina Wildkirkli	Mousterian I, or Micoqian *H. Neandertalensis*
		Conliège St. Acheul East Anglia Hampshire	?	Acheulean III
Tyrrhenian.	Upper	St. Acheul Laussel ?	Achenheim Markkleeberg	Acheulean II
	Lower	St. Acheul	Huntisberg	Acheulean I
		Chelles Caversham	Mauer	Chellean *H. Heidelbergensis* *Eoanthropus*

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